



SEQUENCE LISTING

<110> Microbial Technics Limited
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<120> Proteins

<130> PWC/P21122WO

<140> PCT/GB99/02452

<141> 1999-07-27

<150> GB 9816336.3

<151> 1998-07-27

<150> US 60/125329

<151> 1999-03-19

<160> 196

<170> PatentIn Ver. 2.1

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<211> 1200

<212> DNA

<213> Streptococcus pneumoniae

<400> 1

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<211> 399

<212> PRT

<213> Streptococcus pneumoniae

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Gly Ile Ser Val Gly Ile Gly His Leu Gln Gly Ser Ser Met Ala Lys
35 40 45

Asn Asn Lys Val Ala Val Val Thr Thr Val Pro Ser Val Ala Glu Gly
50 55 60

Leu Lys Asn Val Asn Gly Val Asn Phe Asp Tyr Lys Asp Glu Ala Ser
65 70 75 80

Ala Lys Glu Ala Ile Lys Glu Glu Lys Leu Lys Gly Tyr Leu Thr Ile
85 90 95

Asp Gln Glu Asp Ser Val Leu Lys Ala Val Tyr His Gly Glu Thr Ser
100 105 110

Leu Glu Asn Gly Ile Lys Phe Glu Val Thr Gly Thr Leu Asn Glu Leu
115 120 125

Gln Asn Gln Leu Asn Arg Ser Thr Ala Ser Leu Ser Gln Glu Gln Glu
130 135 140

Lys Arg Leu Ala Gln Thr Ile Gln Phe Thr Glu Lys Ile Asp Glu Ala
145 150 155 160

Lys Glu Asn Lys Lys Phe Ile Gln Thr Ile Ala Ala Gly Ala Leu Gly
165 170 175

Phe Phe Leu Tyr Met Ile Leu Ile Thr Tyr Ala Gly Val Thr Ala Gln
180 185 190

Glu Val Ala Ser Glu Lys Gly Thr Lys Ile Met Glu Val Val Phe Ser
195 200 205

Ser Ile Arg Ala Ser His Tyr Phe Tyr Ala Arg Met Met Ala Leu Phe
210 215 220

Leu Val Ile Leu Thr His Ile Gly Ile Tyr Val Val Gly Gly Leu Ala
225 230 235 240

Ala Val Leu Leu Phe Lys Asp Leu Pro Phe Leu Ala Gln Ser Gly Ile
245 250 255

Leu Asp His Leu Gly Asp Ala Ile Ser Leu Asn Thr Leu Leu Phe Ile
260 265 270

Leu Ile Ser Leu Phe Met Tyr Val Val Leu Ala Ala Phe Leu Gly Ser
275 280 285

Met Val Ser Arg Pro Glu Asp Ser Gly Lys Ala Leu Ser Pro Leu Met

290

295

300

Ile Leu Ile Met Gly Gly Phe Phe Gly Val Thr Ala Leu Gly Ala Ala
305 310 315 320

Gly Asp Asn Leu Leu Leu Lys Ile Gly Ser Tyr Ile Pro Phe Ile Ser
325 330 335

Thr Phe Phe Met Pro Phe Arg Thr Ile Asn Asp Tyr Ala Gly Gly Ala
340 345 350

Glu Ala Trp Ile Ser Leu Ala Ile Thr Val Ile Phe Ala Val Val Ala
355 360 365

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370 375 380

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<212> DNA

<213> Streptococcus pneumoniae

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aaatatctgc ctgggtctaata tgaagactta aaaaatcaaa cctatcctaa agaggatatt 180
gaaattctat ttataaatgc tatgtccaca gatgggacca cagctatcat tcagcaattt 240
ataaaggaag atacagagtt taactcaatt agattgtata acaatcctaa gaaaaatcaa 300
gctagtgggt ttaacctggg agttaaacat tctgtagggg accttatttt aaaaattgat 360
gctcattcaa aagttactga gacttttgta atgaacaatg tggctattat tcaacaagggt 420
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attcgagaat atgggtataa aatccgctat agcccaagta ttctatctta tcagtatatt 720
cgaccaacat tcaagaaaat gctgcaccaa aagtattcaa atgggtttgtg gattggccttg 780
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<211> 374

<212> PRT

<213> Streptococcus pneumoniae

<400> 4

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 Val Ile Ser Ala Tyr Asn Glu Glu Lys Tyr Leu Pro Gly Leu Ile Glu
 35 40 45
 Asp Leu Lys Asn Gln Thr Tyr Pro Lys Glu Asp Ile Glu Ile Leu Phe
 50 55 60
 Ile Asn Ala Met Ser Thr Asp Gly Thr Thr Ala Ile Ile Gln Gln Phe
 65 70 75 80
 Ile Lys Glu Asp Thr Glu Phe Asn Ser Ile Arg Leu Tyr Asn Asn Pro
 85 90 95
 Lys Lys Asn Gln Ala Ser Gly Phe Asn Leu Gly Val Lys His Ser Val
 100 105 110
 Gly Asp Leu Ile Leu Lys Ile Asp Ala His Ser Lys Val Thr Glu Thr
 115 120 125
 Phe Val Met Asn Asn Val Ala Ile Ile Gln Gln Gly Glu Phe Val Cys
 130 135 140
 Gly Gly Pro Arg Pro Thr Ile Val Glu Gly Lys Gly Lys Trp Ala Glu
 145 150 155 160
 Thr Leu His Leu Val Glu Glu Asn Met Phe Gly Ser Ser Ile Ala Asn
 165 170 175
 Tyr Arg Asn Ser Ser Glu Asp Arg Tyr Val Ser Ser Ile Phe His Gly
 180 185 190
 Met Tyr Lys Arg Glu Val Phe Gln Lys Val Gly Leu Val Asn Glu Gln
 195 200 205
 Leu Gly Arg Thr Glu Asp Asn Asp Ile His Tyr Arg Ile Arg Glu Tyr
 210 215 220
 Gly Tyr Lys Ile Arg Tyr Ser Pro Ser Ile Leu Ser Tyr Gln Tyr Ile
 225 230 235 240
 Arg Pro Thr Phe Lys Lys Met Leu His Gln Lys Tyr Ser Asn Gly Leu
 245 250 255
 Trp Ile Gly Leu Thr Ser His Val Gln Phe Lys Cys Leu Ser Leu Phe
 260 265 270
 His Tyr Val Pro Cys Leu Phe Val Leu Ser Leu Val Phe Ser Leu Ala
 275 280 285
 Leu Leu Pro Ile Thr Phe Val Phe Ile Thr Leu Leu Leu Gly Ala Tyr
 290 295 300
 Phe Leu Leu Leu Ser Leu Leu Thr Leu Leu Thr Leu Leu Lys His Lys
 305 310 315 320

Asn Gly Phe Leu Ile Val Met Pro Phe Ile Leu Phe Ser Ile His Phe
325 330 335

Ala Tyr Gly Leu Gly Thr Ile Val Gly Leu Ile Arg Gly Phe Lys Trp
340 345 350

Lys Lys Glu Tyr Lys Arg Thr Ile Ile Tyr Leu Asp Lys Ile Ser Gln
355 360 365

Ile Asn Gln Asn Met Leu
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<213> Streptococcus pneumoniae

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agcactttta ttgttaagcc agaataacg agtaccacgc gaatttacgt agtgaatcgc 180
aatcaaggag acaagccggg gttgacaaat caggatttgc aggcaggaac ttatctggta 240
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acccgtattg tctctatttc agttaatgat cgagttcctg aagaggcaag ccgtatcgct 420
aactctttga gagaagtagc tgctcaaaaa attatcagta ttactcgtgt ttctgacgtg 480
acaacactgg aggaggcaag gccggcgata tccccgtctt cgccaaatat taaacgcaat 540
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<211> 231
<212> PRT
<213> Streptococcus pneumoniae

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Lys Ser Leu Trp Lys Arg Lys Leu Met Ile Leu Ile Val Ala Leu Val
20 25 30

Thr Gly Ala Gly Ala Phe Ala Tyr Ser Thr Phe Ile Val Lys Pro Glu
35 40 45

Tyr Thr Ser Thr Thr Arg Ile Tyr Val Val Asn Arg Asn Gln Gly Asp
50 55 60

Lys Pro Gly Leu Thr Asn Gln Asp Leu Gln Ala Gly Thr Tyr Leu Val
65 70 75 80

Lys Asp Tyr Arg Glu Ile Ile Leu Ser Gln Asp Val Leu Glu Glu Val

| 85 | | | | | | | | | | 90 | | | | | 95 | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|--|--|
| Val | Ser | Asp | Leu | Lys | Leu | Asp | Leu | Thr | Pro | Lys | Gly | Leu | Ala | Asn | Lys | | | | |
| | | | 100 | | | | | 105 | | | | | 110 | | | | | | |
| Ile | Lys | Val | Thr | Val | Pro | Val | Asp | Thr | Arg | Ile | Val | Ser | Ile | Ser | Val | | | | |
| | 115 | | | | | | 120 | | | | | 125 | | | | | | | |
| Asn | Asp | Arg | Val | Pro | Glu | Glu | Ala | Ser | Arg | Ile | Ala | Asn | Ser | Leu | Arg | | | | |
| | 130 | | | | | 135 | | | | | 140 | | | | | | | | |
| Glu | Val | Ala | Ala | Gln | Lys | Ile | Ile | Ser | Ile | Thr | Arg | Val | Ser | Asp | Val | | | | |
| 145 | | | | 150 | | | | | 155 | | | | | 160 | | | | | |
| Thr | Thr | Leu | Glu | Glu | Ala | Arg | Pro | Ala | Ile | Ser | Pro | Ser | Ser | Pro | Asn | | | | |
| | | | 165 | | | | | 170 | | | | | | 175 | | | | | |
| Ile | Lys | Arg | Asn | Thr | Leu | Ile | Gly | Phe | Leu | Ala | Gly | Val | Ile | Gly | Thr | | | | |
| | | 180 | | | | | 185 | | | | | | 190 | | | | | | |
| Ser | Val | Ile | Val | Leu | His | Leu | Glu | Leu | Leu | Asp | Thr | Arg | Val | Lys | Arg | | | | |
| | 195 | | | | | | 200 | | | | | 205 | | | | | | | |
| Pro | Glu | Asp | Ile | Glu | Asn | Thr | Leu | Gln | Met | Thr | Leu | Leu | Gly | Val | Val | | | | |
| | 210 | | | | | 215 | | | | | 220 | | | | | | | | |
| Pro | Asn | Leu | Gly | Lys | Leu | Lys | | | | | | | | | | | | | |
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 <213> Streptococcus pneumoniae

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 gacggcggtc aagagcaaat ccttgatggg cactacgtca aggaaacagt agtggttagat 420
 ggtcagttga caaccagtcg gggtccttca acagcccttg cctttgccta cgagttgggtg 480
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 ggtaaaaatc agtaa 555

<210> 8
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 <212> PRT
 <213> Streptococcus pneumoniae

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Met Val Gly Phe Glu Glu Gln Val Thr Gly Ser His Ala Ile Gln Val
35 40 45

Arg Ala Asp His Val Phe Asp Gly Asp Leu Ser Asp Tyr Asp Met Ile
50 55 60

Val Leu Pro Gly Gly Met Pro Gly Ser Ala His Leu Arg Asp Asn Gln
65 70 75 80

Thr Leu Ile Gln Glu Leu Gln Ser Phe Glu Gln Glu Gly Lys Lys Leu
85 90 95

Ala Ala Ile Cys Ala Ala Pro Ile Ala Leu Asn Gln Ala Glu Ile Leu
100 105 110

Lys Asn Lys Arg Tyr Thr Cys Tyr Asp Gly Val Gln Glu Gln Ile Leu
115 120 125

Asp Gly His Tyr Val Lys Glu Thr Val Val Val Asp Gly Gln Leu Thr
130 135 140

Thr Ser Arg Gly Pro Ser Thr Ala Leu Ala Phe Ala Tyr Glu Leu Val
145 150 155 160

Glu Gln Leu Gly Gly Asp Ala Glu Ser Leu Arg Thr Gly Met Leu Tyr
165 170 175

Arg Asp Val Phe Gly Lys Asn Gln
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<211> 306
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<213> Streptococcus pneumoniae

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actacaaatg agcaattgca ggcagttcgt ctctcaggcc tggatcaatcg tgaattgctc 180
ctaaatccca aacatccagc acctgagttg ctcaacttgg ctgcgtttgt caaaagagaa 240
gaagccaagt acagaggaac tgcgacttct gcgcttatgt atgaggaact ctttaaaatg 300
ctttga 306

<210> 10
<211> 101
<212> PRT
<213> Streptococcus pneumoniae

<400> 10
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 35 40 45
 Val Arg Leu Ser Gly Leu Val Asn Arg Glu Leu Leu Leu Asn Pro Lys
 50 55 60
 His Pro Ala Pro Glu Leu Leu Asn Leu Ala Arg Phe Val Lys Arg Glu
 65 70 75 80
 Glu Ala Lys Tyr Arg Gly Thr Ala Thr Ser Ala Leu Met Tyr Glu Glu
 85 90 95
 Leu Phe Lys Met Leu
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 <211> 945
 <212> DNA
 <213> Streptococcus pneumoniae

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 aagctaacct ttggcaagga agtcgaaaac ctagaaatta ctctccacca acacacgctc 240
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 tctgaaactc cgtttctctc ttctggaatt ggtgggattc ttcatatcgc aagtagctac 420
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 aacatctcag ccaatcgcgg acaaaccacc atcataaatg ctagccttga aaatgcgacc 540
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 acaacgcccc atatcggttaa tatctttgat acagttctta cagatagtca gctagagtca 660
 acagagaatc acttccacgc tgaaaatatc caagtccatg gcaagggttga actgactgcc 720
 aaagattatc tcagaatcat cctagaccag aaagaaagcc aacgaattaa ctgggacatc 780
 tcaagcaact atggttctat cttccaattc acaagagaaa agcctgaatc aagagggtacg 840
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 tctgatgata atattgatct aatatccaca ccaagcagac gttga 945

<210> 12
 <211> 314
 <212> PRT
 <213> Streptococcus pneumoniae

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Leu Leu Phe Val Gly Ile Gln Ser Asp Gly Ile Lys Ser Leu Leu Ser
 35 40 45
 Met Ser Lys Glu Pro Val Tyr Asp Ser Arg Thr Glu Lys Leu Thr Phe
 50 55 60
 Gly Lys Glu Val Glu Asn Leu Glu Ile Thr Leu His Gln His Thr Leu
 65 70 75 80
 Thr Ile Thr Asp Ser Phe Asp Asp Gln Ile His Ile Ser Tyr His Pro
 85 90 95
 Ser Leu Ser Ala His His Asp Leu Ile Thr Asn Gln Asn Asp Arg Thr
 100 105 110
 Leu Ser Leu Thr Asp Lys Lys Leu Ser Glu Thr Pro Phe Leu Ser Ser
 115 120 125
 Gly Ile Gly Gly Ile Leu His Ile Ala Ser Ser Tyr Ser Ser Arg Phe
 130 135 140
 Glu Glu Val Ile Leu Arg Leu Pro Lys Gly Arg Thr Leu Lys Gly Ile
 145 150 155 160
 Asn Ile Ser Ala Asn Arg Gly Gln Thr Thr Ile Ile Asn Ala Ser Leu
 165 170 175
 Glu Asn Ala Thr Leu Asn Thr Asn Ser Tyr Ile Leu Arg Ile Glu Gly
 180 185 190
 Ser Arg Ile Lys Asn Ser Lys Leu Thr Thr Pro Asn Ile Val Asn Ile
 195 200 205
 Phe Asp Thr Val Leu Thr Asp Ser Gln Leu Glu Ser Thr Glu Asn His
 210 215 220
 Phe His Ala Glu Asn Ile Gln Val His Gly Lys Val Glu Leu Thr Ala
 225 230 235 240
 Lys Asp Tyr Leu Arg Ile Ile Leu Asp Gln Lys Glu Ser Gln Arg Ile
 245 250 255
 Asn Trp Asp Ile Ser Ser Asn Tyr Gly Ser Ile Phe Gln Phe Thr Arg
 260 265 270
 Glu Lys Pro Glu Ser Arg Gly Thr Glu Leu Ser Asn Pro Tyr Lys Thr
 275 280 285
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 Ile Asp Leu Ile Ser Thr Pro Ser Arg Arg
 305 310

<210> 13
 <211> 879
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 13
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 ccaattgaaa aaaataactca gtttagaggag gaagtcacctc aagctgaagt cgaattggaa 180
 agccagcaag aagagaaaaat tgaagctcct gaagacagtg aagcgagaac agaaatagaa 240
 gaaaagaagg catctaattc tactgaagaa gagccagacc tttctaaaga aacagaaaaa 300
 gtcactatag ctgaagagag ccaagaagct cttcctcagc aaaaagcaac cacgaaagag 360
 ccacttctta tcagtaaatac tttagaaagt ccttatatcc ccgaccaagc tccaaaatct 420
 agggataaat ggaaagagca agtgcttgat ttttgggtctt ggctagtggg agcgatcaaa 480
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 attctgtttt ctgcatcttc ctttttcttt agtatctatc acatcaaaca tgcttactat 600
 ggacatatag caagcattaa cagtcgcttc cctgagcagc tagctccttt aactcttttt 660
 tctatcatct ctatcctagt agcgacaaca ctcttcttct tttcattcct cttgggtagt 720
 ttcgttgtga gacgatttat ccaccaggaa aaggactgga cgctagacaa ggttctccaa 780
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 tctttgatag cctacgattt acagccctct tgtgtgtga 879

<210> 14
 <211> 292
 <212> PRT
 <213> Streptococcus pneumoniae

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 35 40 45
 Glu Glu Glu Val Pro Gln Ala Glu Val Glu Leu Glu Ser Gln Gln Glu
 50 55 60
 Glu Lys Ile Glu Ala Pro Glu Asp Ser Glu Ala Arg Thr Glu Ile Glu
 65 70 75 80
 Glu Lys Lys Ala Ser Asn Ser Thr Glu Glu Glu Pro Asp Leu Ser Lys
 85 90 95
 Glu Thr Glu Lys Val Thr Ile Ala Glu Glu Ser Gln Glu Ala Leu Pro
 100 105 110
 Gln Gln Lys Ala Thr Thr Lys Glu Pro Leu Leu Ile Ser Lys Ser Leu
 115 120 125
 Glu Ser Pro Tyr Ile Pro Asp Gln Ala Pro Lys Ser Arg Asp Lys Trp
 130 135 140
 Lys Glu Gln Val Leu Asp Phe Trp Ser Trp Leu Val Glu Ala Ile Lys

145 150 155 160
 Ser Pro Thr Ser Lys Leu Glu Thr Ser Ile Thr His Ser Tyr Thr Ala
 165 170 175
 Phe Leu Leu Leu Ile Leu Phe Ser Ala Ser Ser Phe Phe Phe Ser Ile
 180 185 190
 Tyr His Ile Lys His Ala Tyr Tyr Gly His Ile Ala Ser Ile Asn Ser
 195 200 205
 Arg Phe Pro Glu Gln Leu Ala Pro Leu Thr Leu Phe Ser Ile Ile Ser
 210 215 220
 Ile Leu Val Ala Thr Thr Leu Phe Phe Phe Ser Phe Leu Leu Gly Ser
 225 230 235 240
 Phe Val Val Arg Arg Phe Ile His Gln Glu Lys Asp Trp Thr Leu Asp
 245 250 255
 Lys Val Leu Gln Gln Tyr Ser Gln Leu Leu Ala Ile Pro Ile Ser Ser
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 Pro Ser Cys Val
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<210> 15
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 <212> DNA
 <213> Streptococcus pneumoniae

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 actaccgtta tcggctttat cctgcttttt gtaggtatcc aatctgacgg gattaagagc 180
 ctactttcca tgtccaaaga acctgtctat gatagccgta cggaaaagct aacctttggc 240
 aaggaagtgc aaaacctaga aattactctc caccaacaca cgctcaccat cacagactct 300
 ttcgatgatc aaatccacat ttcttaccat ccatctcttt ctgctcacca tgatcttatt 360
 accaatcaga acgatagaac tctgagtctc actgataaga aactgtctga aactccgttt 420
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 gaagttattc tccgactacc aaaagggaga actctaaaag ggatcaacat ctgagccaat 540
 cgcggacaaa ccaccatcat aaatgctagc cttgaaaatg cgacctcaa tacaaacagc 600
 tatatcctcc gaattgaagg aagtcgtatc aaaaacagta aactcacaac gcccaatatt 660
 gttaatatct ttgatacagt tcttacagat agtcagctag agtcaacaga gaatcacttc 720
 cacgctgaaa atatccaagt ccatggcaag gttgaactga ctgccaaaga ttatctcaga 780
 atcatcctag accagaaaga aagccaacga attactggg acatctcaag caactatggg 840
 tctatcttcc aattcacaag agaaaagcct gaatcaagag gtacggaatt aagcaaccct 900
 tacaaaactg aaaaaaccga tgtcaaggat caactcattg cgagatctga tgataatatt 960
 gatctaatat ccacaccaag cagacgttga 990

<210> 16

<211> 329
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 16

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Gln | Leu | Ala | Ser | Ser | Val | Tyr | Ser | Leu | Phe | Val | Trp | Tyr | Asn | Leu |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | |
| Phe | Leu | Lys | Lys | Glu | Arg | Glu | Val | Ile | Ser | Met | Arg | Lys | Trp | Thr | Lys |
| | | | 20 | | | | | 25 | | | | | 30 | | |
| Gly | Phe | Leu | Ile | Phe | Gly | Val | Val | Thr | Thr | Val | Ile | Gly | Phe | Ile | Leu |
| | | 35 | | | | | 40 | | | | | 45 | | | |
| Leu | Phe | Val | Gly | Ile | Gln | Ser | Asp | Gly | Ile | Lys | Ser | Leu | Leu | Ser | Met |
| | 50 | | | | | 55 | | | | | 60 | | | | |
| Ser | Lys | Glu | Pro | Val | Tyr | Asp | Ser | Arg | Thr | Glu | Lys | Leu | Thr | Phe | Gly |
| 65 | | | | | 70 | | | | | 75 | | | | | 80 |
| Lys | Glu | Val | Glu | Asn | Leu | Glu | Ile | Thr | Leu | His | Gln | His | Thr | Leu | Thr |
| | | | | 85 | | | | | 90 | | | | | 95 | |
| Ile | Thr | Asp | Ser | Phe | Asp | Asp | Gln | Ile | His | Ile | Ser | Tyr | His | Pro | Ser |
| | | | 100 | | | | | 105 | | | | | 110 | | |
| Leu | Ser | Ala | His | His | Asp | Leu | Ile | Thr | Asn | Gln | Asn | Asp | Arg | Thr | Leu |
| | | 115 | | | | | 120 | | | | | 125 | | | |
| Ser | Leu | Thr | Asp | Lys | Lys | Leu | Ser | Glu | Thr | Pro | Phe | Leu | Ser | Ser | Gly |
| | 130 | | | | | 135 | | | | | | 140 | | | |
| Ile | Gly | Gly | Ile | Leu | His | Ile | Ala | Ser | Ser | Tyr | Ser | Ser | Arg | Phe | Glu |
| 145 | | | | | 150 | | | | | 155 | | | | | 160 |
| Glu | Val | Ile | Leu | Arg | Leu | Pro | Lys | Gly | Arg | Thr | Leu | Lys | Gly | Ile | Asn |
| | | | | 165 | | | | | 170 | | | | | 175 | |
| Ile | Ser | Ala | Asn | Arg | Gly | Gln | Thr | Thr | Ile | Ile | Asn | Ala | Ser | Leu | Glu |
| | | | 180 | | | | | 185 | | | | | 190 | | |
| Asn | Ala | Thr | Leu | Asn | Thr | Asn | Ser | Tyr | Ile | Leu | Arg | Ile | Glu | Gly | Ser |
| | | 195 | | | | | 200 | | | | | 205 | | | |
| Arg | Ile | Lys | Asn | Ser | Lys | Leu | Thr | Thr | Pro | Asn | Ile | Val | Asn | Ile | Phe |
| | 210 | | | | | 215 | | | | | 220 | | | | |
| Asp | Thr | Val | Leu | Thr | Asp | Ser | Gln | Leu | Glu | Ser | Thr | Glu | Asn | His | Phe |
| 225 | | | | | 230 | | | | | 235 | | | | | 240 |
| His | Ala | Glu | Asn | Ile | Gln | Val | His | Gly | Lys | Val | Glu | Leu | Thr | Ala | Lys |
| | | | 245 | | | | | | 250 | | | | | 255 | |
| Asp | Tyr | Leu | Arg | Ile | Ile | Leu | Asp | Gln | Lys | Glu | Ser | Gln | Arg | Ile | Asn |
| | | 260 | | | | | | 265 | | | | | 270 | | |
| Trp | Asp | Ile | Ser | Ser | Asn | Tyr | Gly | Ser | Ile | Phe | Gln | Phe | Thr | Arg | Glu |

275 280 285
 Lys Pro Glu Ser Arg Gly Thr Glu Leu Ser Asn Pro Tyr Lys Thr Glu
 290 295 300
 Lys Thr Asp Val Lys Asp Gln Leu Ile Ala Arg Ser Asp Asp Asn Ile
 305 310 315 320
 Asp Leu Ile Ser Thr Pro Ser Arg Arg
 325

<210> 17
 <211> 79
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 17
 atgatatgta aaatgaagca gggagggagc agggcgtgct ggggatggag agtgggggag 60
 ggacgtgct attttaatc 79

<210> 18
 <211> 26
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 18
 Met Ile Cys Lys Met Lys Gln Gly Gly Ser Arg Ala Cys Trp Gly Trp
 1 5 10 15
 Arg Val Gly Glu Gly Arg Cys Tyr Phe Asn
 20 25

<210> 19
 <211> 715
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 19
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 gattgggtcat aatggggctg gaaaatcgac cactataaaa tccctagtca gtatcatttc 120
 acccagcagt ggtcgtatth tggtagacgg tcaggagtta tcggaaaatc gcttggctat 180
 taaacgaaag attggctacg tagcagactc gcctgactta tttttacgct taacggccaa 240
 tgaatttttg gaattgatcg cctcatccta tgatctgagt agatctgact tggaggctag 300
 tctagctagg ctattgaacg tttttgattt tgctgaaaat cgctatcagg ttattgaaac 360
 tctttctcac ggaatgcgtc agaaagtctt tgctatcgga gcactcttgt ctgatcccga 420
 tatttgggtt ttggacgaac ccttgactgg tttggatccc caggctgcct ttgatttgaa 480
 acagatgatg aaggaacatg cacaaaaagg gaagacagtc ttgttttcaa ctcatgtcct 540
 agaggtggca gagcaagtct gtgatcggat tgccattttg aaaaaggggc atttgattta 600
 ttgtggtaag gttagaggact tgaggaaaga ccaccagac cagtctttgg aaagtatcta 660
 ccttagtctt gctggtagaa aagaggaggt tgcggatgcg tctcaaggtc attaa 715

<210> 20
 <211> 237
 <212> PRT
 <213> Streptococcus pneumoniae

 <400> 20
 Asp Lys Glu Ala Leu Ser Asn Leu Asn Leu Gln Ile Glu Asn Gly Glu
 1 5 10 15
 Ile Met Gly Leu Ile Gly His Asn Gly Ala Gly Lys Ser Thr Thr Ile
 20 25 30
 Lys Ser Leu Val Ser Ile Ile Ser Pro Ser Ser Gly Arg Ile Leu Val
 35 40 45
 Asp Gly Gln Glu Leu Ser Glu Asn Arg Leu Ala Ile Lys Arg Lys Ile
 50 55 60
 Gly Tyr Val Ala Asp Ser Pro Asp Leu Phe Leu Arg Leu Thr Ala Asn
 65 70 75 80
 Glu Phe Trp Glu Leu Ile Ala Ser Ser Tyr Asp Leu Ser Arg Ser Asp
 85 90 95
 Leu Glu Ala Ser Leu Ala Arg Leu Leu Asn Val Phe Asp Phe Ala Glu
 100 105 110
 Asn Arg Tyr Gln Val Ile Glu Thr Leu Ser His Gly Met Arg Gln Lys
 115 120 125
 Val Phe Val Ile Gly Ala Leu Leu Ser Asp Pro Asp Ile Trp Val Leu
 130 135 140
 Asp Glu Pro Leu Thr Gly Leu Asp Pro Gln Ala Ala Phe Asp Leu Lys
 145 150 155 160
 Gln Met Met Lys Glu His Ala Gln Lys Gly Lys Thr Val Leu Phe Ser
 165 170 175
 Thr His Val Leu Glu Val Ala Glu Gln Val Cys Asp Arg Ile Ala Ile
 180 185 190
 Leu Lys Lys Gly His Leu Ile Tyr Cys Gly Lys Val Glu Asp Leu Arg
 195 200 205
 Lys Asp His Pro Asp Gln Ser Leu Glu Ser Ile Tyr Leu Ser Leu Ala
 210 215 220
 Gly Arg Lys Glu Glu Val Ala Asp Ala Ser Gln Gly His
 225 230 235

<210> 21
 <211> 360
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 21
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agacctatga tggttccgac gatagagatt aaaagagtga taccagcacc acgcaagagt 120
tggtgccagt tttcagaaag aattttagca acttggctaa agaaactact gctagtctct 180
tcagttgttg tagcttcggc aggttggtcc ttgatcatac gatccatcaa ggcaacttgg 240
tcattctttg aaatggtttc aatgctggca ttgatttggc taatacgatt gtcattttta 300
cgaagcccga tagcgatagc tgtatcttct tccccagttt tgaaaccagg ttctacttga 360

<210> 22
<211> 119
<212> PRT
<213> Streptococcus pneumoniae

<400> 22
Met Ala Leu Phe Ser Glu Arg Gly Ala Val Arg Lys Thr Pro Met Ala
1 5 10 15
Ser Pro Ile Met Arg Pro Met Met Val Pro Thr Ile Glu Ile Lys Arg
20 25 30
Val Ile Pro Ala Pro Arg Lys Ser Cys Cys Gln Phe Ser Glu Arg Ile
35 40 45
Leu Ala Thr Trp Leu Lys Lys Leu Leu Leu Val Ser Ser Val Val Val
50 55 60
Ala Ser Ala Gly Cys Ser Leu Ile Ile Arg Ser Ile Lys Ala Thr Trp
65 70 75 80
Ser Ser Phe Glu Met Val Ser Met Leu Ala Leu Ile Trp Leu Ile Arg
85 90 95
Leu Ser Phe Leu Arg Ser Pro Ile Ala Ile Ala Val Ser Ser Ser Pro
100 105 110
Val Leu Lys Pro Gly Ser Thr
115

<210> 23
<211> 1455
<212> DNA
<213> Streptococcus pneumoniae

<400> 23
atgaaattta gtaaaaaata tatagcagct ggatcagctg ttatcgtatc cttgagtcta 60
tgtgcctatg cactaaacca gcatcggttcg caggaaaata aggacaataa tcgtgtctct 120
tatgtggatg gcagccagtc aagtcagaaa agtgaaaact tgacaccaga ccagggttagc 180
cagaaagaag gaattcaggc tgagcaaatt gtaatcaaaa ttacagatca gggctatgta 240
acgtcacacg gtgaccacta tcattactat aatgggaaag ttccttatga tgccctcttt 300
agtgaagaac tcttgatgaa ggatccaaac tatcaactta aagacgctga tattgtcaat 360
gaagtcaagg gtgggttatat catcaagggtc gatggaaaat attatgtcta cctgaaagat 420
gcagtcgatg ctgataatgt tcgaactaaa gatgaaatca atcgtcaaaa acaagaacat 480
gtcaaagata atgagaaggt taactctaata gttgctgtag caaggtctca gggacgatat 540

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acgacaaatg atgggttatgt ctttaaatcca gctgatatta tcgaagatac gggtaatgct 600
tatatcggtc ctcatggagg tcactatcac tacattccca aaagcgattt atctgctagt 660
gaattagcag cagctaaagc acatctggct ggaaaaaata tgcaaccgag tcagttaagc 720
tattcttcaa cagctagtga caataacacg caatctgtag caaaaggatc aactagcaag 780
ccagcaaata aatctgaaaa tctccagagt cttttgaagg aactctatga ttcacctagc 840
gcccaacgtt acagtgaatc agatggcctg gtctttgacc ctgctaagat tatcagtcgt 900
acaccaaatg gagttgcgat tccgcatggc gaccattacc actttattcc ttacagcaag 960
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gtttctacaa atgcaaaacc taatgaagta gtgtctagtc taggcagtct ttcaagcaat 1080
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ccaaaagata tcggtgaaga aacggctaca gcttatattg taagacatgg tgatcatttc 1200
cattacattc caaaatcaaa tcaaattggg caaccgactc ttccaaacaa tagtctagca 1260
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ggatacggat ttgatgctaa tcgtattatc gctgaagatg aatcagggtt tgtcatgagt 1380
cacggagacc acaatcatta tttcttcaag aaggacttga cagaagagca aattaagggt 1440
cgcaaaaaca tttag 1455

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<210> 24

<211> 484

<212> PRT

<213> Streptococcus pneumoniae

<400> 24

```

Met Lys Phe Ser Lys Lys Tyr Ile Ala Ala Gly Ser Ala Val Ile Val
  1                      5                      10                      15

```

```

Ser Leu Ser Leu Cys Ala Tyr Ala Leu Asn Gln His Arg Ser Gln Glu
          20                      25                      30

```

```

Asn Lys Asp Asn Asn Arg Val Ser Tyr Val Asp Gly Ser Gln Ser Ser
          35                      40                      45

```

```

Gln Lys Ser Glu Asn Leu Thr Pro Asp Gln Val Ser Gln Lys Glu Gly
          50                      55                      60

```

```

Ile Gln Ala Glu Gln Ile Val Ile Lys Ile Thr Asp Gln Gly Tyr Val
          65                      70                      75                      80

```

```

Thr Ser His Gly Asp His Tyr His Tyr Tyr Asn Gly Lys Val Pro Tyr
          85                      90                      95

```

```

Asp Ala Leu Phe Ser Glu Glu Leu Leu Met Lys Asp Pro Asn Tyr Gln
          100                      105                      110

```

```

Leu Lys Asp Ala Asp Ile Val Asn Glu Val Lys Gly Gly Tyr Ile Ile
          115                      120                      125

```

```

Lys Val Asp Gly Lys Tyr Tyr Val Tyr Leu Lys Asp Ala Ala His Ala
          130                      135                      140

```

```

Asp Asn Val Arg Thr Lys Asp Glu Ile Asn Arg Gln Lys Gln Glu His
          145                      150                      155                      160

```

```

Val Lys Asp Asn Glu Lys Val Asn Ser Asn Val Ala Val Ala Arg Ser
          165                      170                      175

```


Gln Gly Arg Tyr Thr Thr Asn Asp Gly Tyr Val Phe Asn Pro Ala Asp
 180 185 190
 Ile Ile Glu Asp Thr Gly Asn Ala Tyr Ile Val Pro His Gly Gly His
 195 200 205
 Tyr His Tyr Ile Pro Lys Ser Asp Leu Ser Ala Ser Glu Leu Ala Ala
 210 215 220
 Ala Lys Ala His Leu Ala Gly Lys Asn Met Gln Pro Ser Gln Leu Ser
 225 230 235 240
 Tyr Ser Ser Thr Ala Ser Asp Asn Asn Thr Gln Ser Val Ala Lys Gly
 245 250 255
 Ser Thr Ser Lys Pro Ala Asn Lys Ser Glu Asn Leu Gln Ser Leu Leu
 260 265 270
 Lys Glu Leu Tyr Asp Ser Pro Ser Ala Gln Arg Tyr Ser Glu Ser Asp
 275 280 285
 Gly Leu Val Phe Asp Pro Ala Lys Ile Ile Ser Arg Thr Pro Asn Gly
 290 295 300
 Val Ala Ile Pro His Gly Asp His Tyr His Phe Ile Pro Tyr Ser Lys
 305 310 315 320
 Leu Ser Ala Leu Glu Glu Lys Ile Ala Arg Met Val Pro Ile Ser Gly
 325 330 335
 Thr Gly Ser Thr Val Ser Thr Asn Ala Lys Pro Asn Glu Val Val Ser
 340 345 350
 Ser Leu Gly Ser Leu Ser Ser Asn Pro Ser Ser Leu Thr Thr Ser Lys
 355 360 365
 Glu Leu Ser Ser Ala Ser Asp Gly Tyr Ile Phe Asn Pro Lys Asp Ile
 370 375 380
 Val Glu Glu Thr Ala Thr Ala Tyr Ile Val Arg His Gly Asp His Phe
 385 390 395 400
 His Tyr Ile Pro Lys Ser Asn Gln Ile Gly Gln Pro Thr Leu Pro Asn
 405 410 415
 Asn Ser Leu Ala Thr Pro Ser Pro Ser Leu Pro Ile Asn Pro Gly Thr
 420 425 430
 Ser His Glu Lys His Glu Glu Asp Gly Tyr Gly Phe Asp Ala Asn Arg
 435 440 445
 Ile Ile Ala Glu Asp Glu Ser Gly Phe Val Met Ser His Gly Asp His
 450 455 460
 Asn His Tyr Phe Phe Lys Lys Asp Leu Thr Glu Glu Gln Ile Lys Val
 465 470 475 480

Arg Lys Asn Ile

<210> 25
 <211> 840
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 25
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 gcagctttgt cggatgtttc tttgacgatt gaagatggct cttatacagc ttttaattggg 120
 cacacaggta gtggtaaatc aactatttta caactcttaa atggttttatt ggtgccaagt 180
 caagggagtg tgagggtttt tgatacctta atcacctcga cttctaaaaa taaagatatt 240
 cgtcaaatta gaaaacagggt tggcttggtg tttcagtttg ctgaaaatca gatttttgaa 300
 gaaacggttt tgaaggacgt tgcttttgga ccgcaaaatt ttggagtctc tgaagaagat 360
 gctgtgaaga ctgcgcgtga gaaactggct ctgggttgaa ttgatgaatc actttttgat 420
 cgtagtccgt ttgagctgtc agggggacaa atgagacgtg ttgccattgc aggcatactt 480
 gccatggagc cagctatatt agtcttagat gagccaacag ctggtctaga tcctctaggg 540
 agaaaagagt tgatgaccct gttcaaaaaa ctccaccagt cagggatgac catcgtcttg 600
 gtaacgcatt tgatggatga tgttgctgaa tatgcgaatc aagtctatgt aatggaaaag 660
 ggacgttttag taaagggggg caaaccaagt gatgtctttc aagacgttgt ttttatggaa 720
 gaagttcagt tgggagtacc taaaattacg gccttttgta aacgattggc tgatagaggc 780
 gtgtcattta aacgattacc gattaagata gaggagtcca aggagtcgct aaatggatag 840

<210> 26
 <211> 279
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 26
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 Pro Leu Ala Ser Ala Ala Leu Ser Asp Val Ser Leu Thr Ile Glu Asp
 20 25 30
 Gly Ser Tyr Thr Ala Leu Ile Gly His Thr Gly Ser Gly Lys Ser Thr
 35 40 45
 Ile Leu Gln Leu Leu Asn Gly Leu Leu Val Pro Ser Gln Gly Ser Val
 50 55 60
 Arg Val Phe Asp Thr Leu Ile Thr Ser Thr Ser Lys Asn Lys Asp Ile
 65 70 75 80
 Arg Gln Ile Arg Lys Gln Val Gly Leu Val Phe Gln Phe Ala Glu Asn
 85 90 95
 Gln Ile Phe Glu Glu Thr Val Leu Lys Asp Val Ala Phe Gly Pro Gln
 100 105 110
 Asn Phe Gly Val Ser Glu Glu Asp Ala Val Lys Thr Ala Arg Glu Lys
 115 120 125

Leu Ala Leu Val Gly Ile Asp Glu Ser Leu Phe Asp Arg Ser Pro Phe
 130 135 140
 Glu Leu Ser Gly Gly Gln Met Arg Arg Val Ala Ile Ala Gly Ile Leu
 145 150 155 160
 Ala Met Glu Pro Ala Ile Leu Val Leu Asp Glu Pro Thr Ala Gly Leu
 165 170 175
 Asp Pro Leu Gly Arg Lys Glu Leu Met Thr Leu Phe Lys Lys Leu His
 180 185 190
 Gln Ser Gly Met Thr Ile Val Leu Val Thr His Leu Met Asp Asp Val
 195 200 205
 Ala Glu Tyr Ala Asn Gln Val Tyr Val Met Glu Lys Gly Arg Leu Val
 210 215 220
 Lys Gly Gly Lys Pro Ser Asp Val Phe Gln Asp Val Val Phe Met Glu
 225 230 235 240
 Glu Val Gln Leu Gly Val Pro Lys Ile Thr Ala Phe Cys Lys Arg Leu
 245 250 255
 Ala Asp Arg Gly Val Ser Phe Lys Arg Leu Pro Ile Lys Ile Glu Glu
 260 265 270
 Phe Lys Glu Ser Leu Asn Gly
 275

<210> 27
 <211> 6360
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 27
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 caggatttta aagagaagaa aacagcagtc attaaggaaa aagaagttgt tagtaaaaat 180
 cctgtgatag acaataacac tagcaatgaa gaagcaaaaa tcaaagaaga aaattccaat 240
 aaatcccaag gagattatac ggactcattt gtgaataaaa acacagaaaa tccccaaaaa 300
 gaagataaag ttgtctatat tgctgaattt aaagataaag aatctggaga aaaagcaatc 360
 aaggaactat ccagtcttaa gaatacaaaa gttttatata cttatgatag aatttttaac 420
 ggtagtgcca tagaaacaac tccagataac ttggacaaaa ttaaacaatc agaagggtatt 480
 tcatcggttg aaagggcaca aaaagtccaa cccatgatga atcatgccag aaagggaatt 540
 ggagttgagg aagctattga ttacctaaag tctatcaatg ctccgttttg gaaaaatttt 600
 gatggttagag gtatgggtcat ttcaaatatc gatactggaa cagattatag acataaggct 660
 atgagaatcg atgatgatgc caaagcctca atgagattta aaaaagaaga cttaaaaggc 720
 actgataaaa attattgggt gagtgataaa atccctcatg cgttcaatta ttataatggg 780
 ggcaaaatca ctgtagaaaa atatgatgat ggaagggatt attttgacct acatggggatg 840
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 gttgatgttg ttccgggtatc atctgggttt acaggaacag gtctttagtag tgagaaatat 1080
 tggcaagcta ttccgggcatt aagaaaagca ggcattccaa tggttgtcgc tacgggtaac 1140

| | | | | | | |
|-------------|-------------|-------------|-------------|-------------|-------------|------|
| tatgcgactt | ctgcttcaag | ttcttcatgg | gatttagtag | caaataatca | tctgaaaatg | 1200 |
| accgacactg | gaaatgtaac | acgaactgca | gcacatgaag | atgcgatagc | ggtcgcttct | 1260 |
| gctaaaaatc | aaacagttga | gtttgataaa | gttaacatag | gtggagaaaag | ttttaaatatc | 1320 |
| agaaatatag | gggccttttt | cgataagagt | aaaatcacia | caaatagaaga | tggaaacaaaa | 1380 |
| gctcctagta | aattaaaaatt | tgtatatata | ggcaaggggc | aagaccaaga | tttgataggt | 1440 |
| ttggatctta | ggggcaaaaat | tgcagtaattg | gatagaattt | atacaaagga | tttaaaaaaat | 1500 |
| gcttttataa | aagctatgga | taagggtgca | cgcgccatta | tggttgtaaa | tactgtaaat | 1560 |
| tactacaata | gagataattg | gacagagctt | ccagctatgg | gatatgaagc | ggatgaaggt | 1620 |
| actaaaagtc | aagtgttttc | aatttcagga | gatgatgggt | taaagctatg | gaacatgatt | 1680 |
| aatcctgata | aaaaaactga | agtcaaaaga | aataataaag | aagatttttaa | agataaattg | 1740 |
| gagcaatact | atccaattga | tatggaaagt | tttaattcca | acaaaccgaa | tgtaggtgac | 1800 |
| gaaaaagaga | ttgactttta | gtttgcacct | gacacagaca | aagaactcta | taaagaagat | 1860 |
| atcatcggtc | cagcaggatc | tacatcttgg | gggccaagaa | tagattttact | tttaaaaccc | 1920 |
| gatgtttcag | cacctggtta | aaatattaaa | tccacgctta | atgttattaa | tggcaaataca | 1980 |
| acttatggct | atatgtcagg | aactagtatg | gcgactccaa | tcgtggcagc | ttctactgtt | 2040 |
| ttgattagac | cgaaattaaa | ggaaatgctt | gaaagacctg | tattgaaaaa | tcttaagggga | 2100 |
| gatgacaaaa | tagatcttac | aagtcttaca | aaaattgccc | tacaaaatac | tgcgcgacct | 2160 |
| atgatggatg | caacttcttg | gaaagaaaaa | agtcaatact | ttgcatcacc | tagacaacag | 2220 |
| ggagcaggcc | taattaatgt | ggccaatgct | ttgagaaatg | aagttgtagc | aactttcaaa | 2280 |
| aacactgatt | ctaaagggtt | ggtaaaactca | tatggttcca | tttctcttaa | agaaataaaa | 2340 |
| ggtgataaaa | aatactttac | aatcaagctt | cacaatacat | caaacagacc | tttgactttt | 2400 |
| aaagtttcag | catcagcgat | aactacagat | tctctaactg | acagattaaa | acttgatgaa | 2460 |
| acatatataag | atgaaaaatc | tccagatggg | aagcaaattg | ttccagaaat | tcacccagaa | 2520 |
| aaagtcaaaag | gagcaaatat | cacatttgag | catgatactt | tcactatagg | cgcaaattct | 2580 |
| agcttttgatt | tgaatgcggg | tataaatgtt | ggagaggcca | aaaacaaaaa | taaatttgta | 2640 |
| gaatcattta | ttcattttga | gtcagtggaa | gcgatggaag | ctctaaactc | cagcgggaag | 2700 |
| aaaataaact | tccaaccttc | tttgtcgatg | cctctaattg | gatttgctgg | gaattggaac | 2760 |
| cacgaacca | tccttgataa | atgggcttgg | gaagaagggt | caagatcaaa | aacactggga | 2820 |
| ggttatgatg | atgatggtaa | accgaaaatt | ccaggaacct | taaataaggg | aattggtgga | 2880 |
| gaacatggta | tagataaatt | taatccagca | ggagttatac | aaaatagaaa | agataaaaaat | 2940 |
| acaacatccc | tggatcaaaa | tccagaatta | tttgctttca | ataacgaagg | gatcaacgct | 3000 |
| ccatcatcaa | gtggttctaa | gattgctaac | atztatcctt | tagattcaaa | tggaaatcct | 3060 |
| caagatgctc | aacttgaaaag | aggattaaca | ccttctccac | ttgtattaag | aagtgcagaa | 3120 |
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| ggagatttaa | ggggaaaaat | cattgaagtc | attgcattag | atgggttctag | caatttcaca | 3840 |
| aagattcata | gaattaaatt | tgctaatacag | gctgatgaaa | aggggatgat | ttcctattat | 3900 |
| ctagtagatc | ctgatcaaga | ttcatctaaa | tatcaaaagc | ttggcgagat | tgcagaatct | 3960 |
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<211> 2119

<212> PRT

<213> Streptococcus pneumoniae

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Ile Ser Asp Lys Glu Lys Val Ala Glu Asn Lys Glu Lys His Glu Asn
          20              25              30

```

```

Ile His Ser Ala Met Glu Thr Ser Gln Asp Phe Lys Glu Lys Lys Thr
          35              40              45

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Ala Val Ile Lys Glu Lys Glu Val Val Ser Lys Asn Pro Val Ile Asp
          50              55              60

```

```

Asn Asn Thr Ser Asn Glu Glu Ala Lys Ile Lys Glu Glu Asn Ser Asn
          65              70              75              80

```

```

Lys Ser Gln Gly Asp Tyr Thr Asp Ser Phe Val Asn Lys Asn Thr Glu
          85              90              95

```

```

Asn Pro Lys Lys Glu Asp Lys Val Val Tyr Ile Ala Glu Phe Lys Asp

```

| 100 | 105 | 110 |
|---|-----|---------|
| Lys Glu Ser Gly Glu Lys Ala Ile Lys Glu Leu Ser Ser Leu Lys Asn | | |
| 115 | 120 | 125 |
| Thr Lys Val Leu Tyr Thr Tyr Asp Arg Ile Phe Asn Gly Ser Ala Ile | | |
| 130 | 135 | 140 |
| Glu Thr Thr Pro Asp Asn Leu Asp Lys Ile Lys Gln Ile Glu Gly Ile | | |
| 145 | 150 | 155 160 |
| Ser Ser Val Glu Arg Ala Gln Lys Val Gln Pro Met Met Asn His Ala | | |
| 165 | 170 | 175 |
| Arg Lys Glu Ile Gly Val Glu Glu Ala Ile Asp Tyr Leu Lys Ser Ile | | |
| 180 | 185 | 190 |
| Asn Ala Pro Phe Gly Lys Asn Phe Asp Gly Arg Gly Met Val Ile Ser | | |
| 195 | 200 | 205 |
| Asn Ile Asp Thr Gly Thr Asp Tyr Arg His Lys Ala Met Arg Ile Asp | | |
| 210 | 215 | 220 |
| Asp Asp Ala Lys Ala Ser Met Arg Phe Lys Lys Glu Asp Leu Lys Gly | | |
| 225 | 230 | 235 240 |
| Thr Asp Lys Asn Tyr Trp Leu Ser Asp Lys Ile Pro His Ala Phe Asn | | |
| 245 | 250 | 255 |
| Tyr Tyr Asn Gly Gly Lys Ile Thr Val Glu Lys Tyr Asp Asp Gly Arg | | |
| 260 | 265 | 270 |
| Asp Tyr Phe Asp Pro His Gly Met His Ile Ala Gly Ile Leu Ala Gly | | |
| 275 | 280 | 285 |
| Asn Asp Thr Glu Gln Asp Ile Lys Asn Phe Asn Gly Ile Asp Gly Ile | | |
| 290 | 295 | 300 |
| Ala Pro Asn Ala Gln Ile Phe Ser Tyr Lys Met Tyr Ser Asp Ala Gly | | |
| 305 | 310 | 315 320 |
| Ser Gly Phe Ala Gly Asp Glu Thr Met Phe His Ala Ile Glu Asp Ser | | |
| 325 | 330 | 335 |
| Ile Lys His Asn Val Asp Val Val Ser Val Ser Ser Gly Phe Thr Gly | | |
| 340 | 345 | 350 |
| Thr Gly Leu Val Gly Glu Lys Tyr Trp Gln Ala Ile Arg Ala Leu Arg | | |
| 355 | 360 | 365 |
| Lys Ala Gly Ile Pro Met Val Val Ala Thr Gly Asn Tyr Ala Thr Ser | | |
| 370 | 375 | 380 |
| Ala Ser Ser Ser Ser Trp Asp Leu Val Ala Asn Asn His Leu Lys Met | | |
| 385 | 390 | 395 400 |
| Thr Asp Thr Gly Asn Val Thr Arg Thr Ala Ala His Glu Asp Ala Ile | | |

| 405 | | | | | | | | | | 410 | | | | | 415 | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|--|--|
| Ala | Val | Ala | Ser | Ala | Lys | Asn | Gln | Thr | Val | Glu | Phe | Asp | Lys | Val | Asn | | | | |
| | | | 420 | | | | | 425 | | | | | 430 | | | | | | |
| Ile | Gly | Gly | Glu | Ser | Phe | Lys | Tyr | Arg | Asn | Ile | Gly | Ala | Phe | Phe | Asp | | | | |
| | | 435 | | | | | 440 | | | | | 445 | | | | | | | |
| Lys | Ser | Lys | Ile | Thr | Thr | Asn | Glu | Asp | Gly | Thr | Lys | Ala | Pro | Ser | Lys | | | | |
| | | 450 | | | | 455 | | | | | 460 | | | | | | | | |
| Leu | Lys | Phe | Val | Tyr | Ile | Gly | Lys | Gly | Gln | Asp | Gln | Asp | Leu | Ile | Gly | | | | |
| 465 | | | | | 470 | | | | | 475 | | | | | 480 | | | | |
| Leu | Asp | Leu | Arg | Gly | Lys | Ile | Ala | Val | Met | Asp | Arg | Ile | Tyr | Thr | Lys | | | | |
| | | | | 485 | | | | | 490 | | | | | | 495 | | | | |
| Asp | Leu | Lys | Asn | Ala | Phe | Lys | Lys | Ala | Met | Asp | Lys | Gly | Ala | Arg | Ala | | | | |
| | | | 500 | | | | | 505 | | | | | 510 | | | | | | |
| Ile | Met | Val | Val | Asn | Thr | Val | Asn | Tyr | Tyr | Asn | Arg | Asp | Asn | Trp | Thr | | | | |
| | | 515 | | | | | 520 | | | | | 525 | | | | | | | |
| Glu | Leu | Pro | Ala | Met | Gly | Tyr | Glu | Ala | Asp | Glu | Gly | Thr | Lys | Ser | Gln | | | | |
| | | 530 | | | | 535 | | | | | 540 | | | | | | | | |
| Val | Phe | Ser | Ile | Ser | Gly | Asp | Asp | Gly | Val | Lys | Leu | Trp | Asn | Met | Ile | | | | |
| 545 | | | | | 550 | | | | | 555 | | | | | 560 | | | | |
| Asn | Pro | Asp | Lys | Lys | Thr | Glu | Val | Lys | Arg | Asn | Asn | Lys | Glu | Asp | Phe | | | | |
| | | | | 565 | | | | | 570 | | | | | 575 | | | | | |
| Lys | Asp | Lys | Leu | Glu | Gln | Tyr | Tyr | Pro | Ile | Asp | Met | Glu | Ser | Phe | Asn | | | | |
| | | | 580 | | | | | 585 | | | | | 590 | | | | | | |
| Ser | Asn | Lys | Pro | Asn | Val | Gly | Asp | Glu | Lys | Glu | Ile | Asp | Phe | Lys | Phe | | | | |
| | | 595 | | | | | 600 | | | | | 605 | | | | | | | |
| Ala | Pro | Asp | Thr | Asp | Lys | Glu | Leu | Tyr | Lys | Glu | Asp | Ile | Ile | Val | Pro | | | | |
| | | 610 | | | | 615 | | | | | 620 | | | | | | | | |
| Ala | Gly | Ser | Thr | Ser | Trp | Gly | Pro | Arg | Ile | Asp | Leu | Leu | Leu | Lys | Pro | | | | |
| 625 | | | | | 630 | | | | | 635 | | | | | 640 | | | | |
| Asp | Val | Ser | Ala | Pro | Gly | Lys | Asn | Ile | Lys | Ser | Thr | Leu | Asn | Val | Ile | | | | |
| | | | | 645 | | | | | 650 | | | | | 655 | | | | | |
| Asn | Gly | Lys | Ser | Thr | Tyr | Gly | Tyr | Met | Ser | Gly | Thr | Ser | Met | Ala | Thr | | | | |
| | | | 660 | | | | | 665 | | | | | 670 | | | | | | |
| Pro | Ile | Val | Ala | Ala | Ser | Thr | Val | Leu | Ile | Arg | Pro | Lys | Leu | Lys | Glu | | | | |
| | | 675 | | | | | 680 | | | | | 685 | | | | | | | |
| Met | Leu | Glu | Arg | Pro | Val | Leu | Lys | Asn | Leu | Lys | Gly | Asp | Asp | Lys | Ile | | | | |
| | | 690 | | | | 695 | | | | | 700 | | | | | | | | |
| Asp | Leu | Thr | Ser | Leu | Thr | Lys | Ile | Ala | Leu | Gln | Asn | Thr | Ala | Arg | Pro | | | | |

| | | | |
|---|-----|------|------|
| 705 | 710 | 715 | 720 |
| Met Met Asp Ala Thr Ser Trp Lys Glu Lys Ser Gln Tyr Phe Ala Ser | 725 | 730 | 735 |
| Pro Arg Gln Gln Gly Ala Gly Leu Ile Asn Val Ala Asn Ala Leu Arg | 740 | 745 | 750 |
| Asn Glu Val Val Ala Thr Phe Lys Asn Thr Asp Ser Lys Gly Leu Val | 755 | 760 | 765 |
| Asn Ser Tyr Gly Ser Ile Ser Leu Lys Glu Ile Lys Gly Asp Lys Lys | 770 | 775 | 780 |
| Tyr Phe Thr Ile Lys Leu His Asn Thr Ser Asn Arg Pro Leu Thr Phe | 785 | 790 | 800 |
| Lys Val Ser Ala Ser Ala Ile Thr Thr Asp Ser Leu Thr Asp Arg Leu | 805 | 810 | 815 |
| Lys Leu Asp Glu Thr Tyr Lys Asp Glu Lys Ser Pro Asp Gly Lys Gln | 820 | 825 | 830 |
| Ile Val Pro Glu Ile His Pro Glu Lys Val Lys Gly Ala Asn Ile Thr | 835 | 840 | 845 |
| Phe Glu His Asp Thr Phe Thr Ile Gly Ala Asn Ser Ser Phe Asp Leu | 850 | 855 | 860 |
| Asn Ala Val Ile Asn Val Gly Glu Ala Lys Asn Lys Asn Lys Phe Val | 865 | 870 | 875 |
| Glu Ser Phe Ile His Phe Glu Ser Val Glu Ala Met Glu Ala Leu Asn | 885 | 890 | 895 |
| Ser Ser Gly Lys Lys Ile Asn Phe Gln Pro Ser Leu Ser Met Pro Leu | 900 | 905 | 910 |
| Met Gly Phe Ala Gly Asn Trp Asn His Glu Pro Ile Leu Asp Lys Trp | 915 | 920 | 925 |
| Ala Trp Glu Glu Gly Ser Arg Ser Lys Thr Leu Gly Gly Tyr Asp Asp | 930 | 935 | 940 |
| Asp Gly Lys Pro Lys Ile Pro Gly Thr Leu Asn Lys Gly Ile Gly Gly | 945 | 950 | 955 |
| Glu His Gly Ile Asp Lys Phe Asn Pro Ala Gly Val Ile Gln Asn Arg | 965 | 970 | 975 |
| Lys Asp Lys Asn Thr Thr Ser Leu Asp Gln Asn Pro Glu Leu Phe Ala | 980 | 985 | 990 |
| Phe Asn Asn Glu Gly Ile Asn Ala Pro Ser Ser Ser Gly Ser Lys Ile | 995 | 1000 | 1005 |
| Ala Asn Ile Tyr Pro Leu Asp Ser Asn Gly Asn Pro Gln Asp Ala Gln | | | |

| 1010 | 1015 | 1020 |
|---|------|------|
| Leu Glu Arg Gly Leu Thr Pro Ser Pro Leu Val Leu Arg Ser Ala Glu 1025 1030 1035 1040 | | |
| Glu Gly Leu Ile Ser Ile Val Asn Thr Asn Lys Glu Gly Glu Asn Gln 1045 1050 1055 | | |
| Arg Asp Leu Lys Val Ile Ser Arg Glu His Phe Ile Arg Gly Ile Leu 1060 1065 1070 | | |
| Asn Ser Lys Ser Asn Asp Ala Lys Gly Ile Lys Ser Ser Lys Leu Lys 1075 1080 1085 | | |
| Val Trp Gly Asp Leu Lys Trp Asp Gly Leu Ile Tyr Asn Pro Arg Gly 1090 1095 1100 | | |
| Arg Glu Glu Asn Ala Pro Glu Ser Lys Asp Asn Gln Asp Pro Ala Thr 1105 1110 1115 1120 | | |
| Lys Ile Arg Gly Gln Phe Glu Pro Ile Ala Glu Gly Gln Tyr Phe Tyr 1125 1130 1135 | | |
| Lys Phe Lys Tyr Arg Leu Thr Lys Asp Tyr Pro Trp Gln Val Ser Tyr 1140 1145 1150 | | |
| Ile Pro Val Lys Ile Asp Asn Thr Ala Pro Lys Ile Val Ser Val Asp 1155 1160 1165 | | |
| Phe Ser Asn Pro Glu Lys Ile Lys Leu Ile Thr Lys Asp Thr Tyr His 1170 1175 1180 | | |
| Lys Val Lys Asp Gln Tyr Lys Asn Glu Thr Leu Phe Ala Arg Asp Gln 1185 1190 1195 1200 | | |
| Lys Glu His Pro Glu Lys Phe Asp Glu Ile Ala Asn Glu Val Trp Tyr 1205 1210 1215 | | |
| Ala Gly Ala Ala Leu Val Asn Glu Asp Gly Glu Val Glu Lys Asn Leu 1220 1225 1230 | | |
| Glu Val Thr Tyr Ala Gly Glu Gly Gln Gly Arg Asn Arg Lys Leu Asp 1235 1240 1245 | | |
| Lys Asp Gly Asn Thr Ile Tyr Glu Ile Lys Gly Ala Gly Asp Leu Arg 1250 1255 1260 | | |
| Gly Lys Ile Ile Glu Val Ile Ala Leu Asp Gly Ser Ser Asn Phe Thr 1265 1270 1275 1280 | | |
| Lys Ile His Arg Ile Lys Phe Ala Asn Gln Ala Asp Glu Lys Gly Met 1285 1290 1295 | | |
| Ile Ser Tyr Tyr Leu Val Asp Pro Asp Gln Asp Ser Ser Lys Tyr Gln 1300 1305 1310 | | |
| Lys Leu Gly Glu Ile Ala Glu Ser Lys Phe Lys Asn Leu Gly Asn Gly | | |

| 1315 | 1320 | 1325 |
|--|------|------|
| Lys Glu Gly Ser Leu Lys Lys Asp Thr Thr Gly Val Glu His His His 1330 1335 1340 | | |
| Gln Glu Asn Glu Glu Ser Ile Lys Glu Lys Ser Ser Phe Thr Ile Asp 1345 1350 1355 1360 | | |
| Arg Asn Ile Ser Thr Ile Arg Asp Phe Glu Asn Lys Asp Leu Lys Lys 1365 1370 1375 | | |
| Leu Ile Lys Lys Lys Phe Arg Glu Val Asp Asp Phe Thr Ser Glu Thr 1380 1385 1390 | | |
| Gly Lys Arg Met Glu Glu Tyr Asp Tyr Lys Tyr Asp Asp Lys Gly Asn 1395 1400 1405 | | |
| Ile Ile Ala Tyr Asp Asp Gly Thr Asp Leu Glu Tyr Glu Thr Glu Lys 1410 1415 1420 | | |
| Leu Asp Glu Ile Lys Ser Lys Ile Tyr Gly Val Leu Ser Pro Ser Lys 1425 1430 1435 1440 | | |
| Asp Gly His Phe Glu Ile Leu Gly Lys Ile Ser Asn Val Ser Lys Asn 1445 1450 1455 | | |
| Ala Lys Val Tyr Tyr Gly Asn Asn Tyr Lys Ser Ile Glu Ile Lys Ala 1460 1465 1470 | | |
| Thr Lys Tyr Asp Phe His Ser Lys Thr Met Thr Phe Asp Leu Tyr Ala 1475 1480 1485 | | |
| Asn Ile Asn Asp Ile Val Asp Gly Leu Ala Phe Ala Gly Asp Met Arg 1490 1495 1500 | | |
| Leu Phe Val Lys Asp Asn Asp Gln Lys Lys Ala Glu Ile Lys Ile Arg 1505 1510 1515 1520 | | |
| Met Pro Glu Lys Ile Lys Glu Thr Lys Ser Glu Tyr Pro Tyr Val Ser 1525 1530 1535 | | |
| Ser Tyr Gly Asn Val Ile Glu Leu Gly Glu Gly Asp Leu Ser Lys Asn 1540 1545 1550 | | |
| Lys Pro Asp Asn Leu Thr Lys Met Glu Ser Gly Lys Ile Tyr Ser Asp 1555 1560 1565 | | |
| Ser Glu Lys Gln Gln Tyr Leu Leu Lys Asp Asn Ile Ile Leu Arg Lys 1570 1575 1580 | | |
| Gly Tyr Ala Leu Lys Val Thr Thr Tyr Asn Pro Gly Lys Thr Asp Met 1585 1590 1595 1600 | | |
| Leu Glu Gly Asn Gly Val Tyr Ser Lys Glu Asp Ile Ala Lys Ile Gln 1605 1610 1615 | | |
| Lys Ala Asn Pro Asn Leu Arg Ala Leu Ser Glu Thr Thr Ile Tyr Ala | | |

| | | |
|---|------|------|
| 1620 | 1625 | 1630 |
| Asp Ser Arg Asn Val Glu Asp Gly Arg Ser Thr Gln Ser Val Leu Met | | |
| 1635 | 1640 | 1645 |
| Ser Ala Leu Asp Gly Phe Asn Ile Ile Arg Tyr Gln Val Phe Thr Phe | | |
| 1650 | 1655 | 1660 |
| Lys Met Asn Asp Lys Gly Glu Ala Ile Asp Lys Asp Gly Asn Leu Val | | |
| 1665 | 1670 | 1675 |
| Thr Asp Ser Ser Lys Leu Val Leu Phe Gly Lys Asp Asp Lys Glu Tyr | | |
| 1685 | 1690 | 1695 |
| Thr Gly Glu Asp Lys Phe Asn Val Glu Ala Ile Lys Glu Asp Gly Ser | | |
| 1700 | 1705 | 1710 |
| Met Leu Phe Ile Asp Thr Lys Pro Val Asn Leu Ser Met Asp Lys Asn | | |
| 1715 | 1720 | 1725 |
| Tyr Phe Asn Pro Ser Lys Ser Asn Lys Ile Tyr Val Arg Asn Pro Glu | | |
| 1730 | 1735 | 1740 |
| Phe Tyr Leu Arg Gly Lys Ile Ser Asp Lys Gly Gly Phe Asn Trp Glu | | |
| 1745 | 1750 | 1755 |
| Leu Arg Val Asn Glu Ser Val Val Asp Asn Tyr Leu Ile Tyr Gly Asp | | |
| 1765 | 1770 | 1775 |
| Leu His Ile Asp Asn Thr Arg Asp Phe Asn Ile Lys Leu Asn Val Lys | | |
| 1780 | 1785 | 1790 |
| Asp Gly Asp Ile Met Asp Trp Gly Met Lys Asp Tyr Lys Ala Asn Gly | | |
| 1795 | 1800 | 1805 |
| Phe Pro Asp Lys Val Thr Asp Met Asp Gly Asn Val Tyr Leu Gln Thr | | |
| 1810 | 1815 | 1820 |
| Gly Tyr Ser Asp Leu Asn Ala Lys Ala Val Gly Val His Tyr Gln Phe | | |
| 1825 | 1830 | 1835 |
| Leu Tyr Asp Asn Val Lys Pro Glu Val Asn Ile Asp Pro Lys Gly Asn | | |
| 1845 | 1850 | 1855 |
| Thr Ser Ile Glu Tyr Ala Asp Gly Lys Ser Val Val Phe Asn Ile Asn | | |
| 1860 | 1865 | 1870 |
| Asp Lys Arg Asn Asn Gly Phe Asp Gly Glu Ile Gln Glu Gln His Ile | | |
| 1875 | 1880 | 1885 |
| Tyr Ile Asn Gly Lys Glu Tyr Thr Ser Phe Asn Asp Ile Lys Gln Ile | | |
| 1890 | 1895 | 1900 |
| Ile Asp Lys Thr Leu Asn Ile Lys Ile Val Val Lys Asp Phe Ala Arg | | |
| 1905 | 1910 | 1915 |
| Asn Thr Thr Val Lys Glu Phe Ile Leu Asn Lys Asp Thr Gly Glu Val | | |

| | | |
|---|------|------|
| 1925 | 1930 | 1935 |
| Ser Glu Leu Lys Pro His Arg Val Thr Val Thr Ile Gln Asn Gly Lys | | |
| 1940 | 1945 | 1950 |
| Glu Met Ser Ser Thr Ile Val Ser Glu Glu Asp Phe Ile Leu Pro Val | | |
| 1955 | 1960 | 1965 |
| Tyr Lys Gly Glu Leu Glu Lys Gly Tyr Gln Phe Asp Gly Trp Glu Ile | | |
| 1970 | 1975 | 1980 |
| Ser Gly Phe Glu Gly Lys Lys Asp Ala Gly Tyr Val Ile Asn Leu Ser | | |
| 1985 | 1990 | 1995 |
| Lys Asp Thr Phe Ile Lys Pro Val Phe Lys Lys Ile Glu Glu Lys Lys | | |
| 2005 | 2010 | 2015 |
| Glu Glu Glu Asn Lys Pro Thr Phe Asp Val Ser Lys Lys Lys Asp Asn | | |
| 2020 | 2025 | 2030 |
| Pro Gln Val Asn His Ser Gln Leu Asn Glu Ser His Arg Lys Glu Asp | | |
| 2035 | 2040 | 2045 |
| Leu Gln Arg Glu Glu His Ser Gln Lys Ser Asp Ser Thr Lys Asp Val | | |
| 2050 | 2055 | 2060 |
| Thr Ala Thr Val Leu Asp Lys Asn Asn Ile Ser Ser Lys Ser Thr Thr | | |
| 2065 | 2070 | 2075 |
| Asn Asn Pro Asn Lys Leu Pro Lys Thr Gly Thr Ala Ser Gly Ala Gln | | |
| 2085 | 2090 | 2095 |
| Thr Leu Leu Ala Ala Gly Ile Met Phe Ile Val Gly Ile Phe Leu Gly | | |
| 2100 | 2105 | 2110 |
| Leu Lys Lys Lys Asn Gln Asp | | |
| 2115 | | |

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 gtcagcgact acctagctct caatgcagggt ttgggttgcca tgaacttggt tcttgcatgg 420
 acagaccaag gaattgggtc taacattatt cttgggttttg acaaatcaaa agttaatgaa 480
 gttttggaaa tcgaagaccg tttccgcccc gaactcttga tcacagtggg ttatacagac 540
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 Ala Pro Ser Ala His Asn Ser Gln Pro Trp Lys Phe Val Val Val Arg
 35 40 45
 Glu Lys Asn Ala Glu Leu Ala Lys Leu Ala Tyr Gly Ser Asn Phe Glu
 50 55 60
 Gln Val Ser Ser Ala Pro Val Thr Ile Ala Leu Phe Thr Asp Thr Asp
 65 70 75 80
 Leu Ala Lys Arg Ala Arg Lys Ile Ala Arg Val Gly Gly Ala Asn Asn
 85 90 95
 Phe Ser Glu Glu Gln Leu Gln Tyr Phe Met Lys Asn Leu Pro Ala Glu
 100 105 110
 Phe Ala Arg Tyr Ser Glu Gln Gln Val Ser Asp Tyr Leu Ala Leu Asn
 115 120 125
 Ala Gly Leu Val Ala Met Asn Leu Val Leu Ala Leu Thr Asp Gln Gly
 130 135 140
 Ile Gly Ser Asn Ile Ile Leu Gly Phe Asp Lys Ser Lys Val Asn Glu
 145 150 155 160
 Val Leu Glu Ile Glu Asp Arg Phe Arg Pro Glu Leu Leu Ile Thr Val
 165 170 175
 Gly Tyr Thr Asp Glu Lys Leu Glu Pro Ser Tyr Arg Leu Pro Val Asp
 180 185 190
 Glu Ile Ile Glu Lys Arg
 195

<210> 31
 <211> 1401
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 31
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 ttgttttagcc ttttggaat caattcagaa cgtgatgaca gcaaggctga tgcccagcat 120
 ccatttgggc ctggtccagt aaaagccttg gagaaattcc ttgaaatcgc agaccgcgat 180

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ggctacccaa ctaagaatgt tgataactat gcaggacatt ttgagtttgg tgatggagaa 240
gaagttctcg gaatctttgc ccatatggat gtggtgcctg ctggtagcgg ttgggacaca 300
gacccttaca caccaactat caaagatggt cgcctttatg cgcgcggggc ttcggacgat 360
aagggtccta caacagcttg ttactatggt ttgaaaatca tcaaagaatt gggctctcca 420
acttctaaga aagttcgctt catcgttgga acagacgaag aatcaggctg ggcagacatg 480
gactactact ttgagcacgt aggacttgcc aaaccagatt tcggtttctc accagatgct 540
gaatttccaa tcatcaatgg tgaaaaagga aatatcacgg aatacctcca cttgcagga 600
gaaaatacag gtgttgcccg tcttcacagc tttacaggtg gtttacgtga aaatatggta 660
ccagaatcag caacagcagt cgtttcaggt gacttggtg acttgcaagc taaactagat 720
gcctttgttg cagaacacaa acttagagga gaactccaag aagaagctgg caaatacaag 780
gtgacgatca ttggtaaatc agcccacggg gctatgcctg cttcaggtgt caatggcgca 840
acttaccttg cctcttctc cagccagttt ggctttgctg gtccagccaa agactacctt 900
gacatcgca gtaaaattct cttgaacgat catgaggggtg aaaatcttaa gattgctcat 960
gtggatgaaa agatgggtgc tctttctatg aatgccggcg tcttccactt cgatgaaaca 1020
agtgctgata ataccattgc cctcaacatc cgctatccaa aaggaacaag tccagaacaa 1080
atcaagtcaa tccttgaaaa cttgccagtt gtttctgtta gcctgtctga acacggtcac 1140
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aaacaaactg gctttaaaag tcatgaacaa gtcacgggtg gtggaacctt tggtcgcttg 1260
ctagaacgcg gagttgccta cggtgctatg ttcccagact cgattgatac catgcaccaa 1320
gccaatgaat ttatcgctt ggatgatctt ttccgagcag cagcaattta tgccgaagct 1380
atttacgaat tgatcaaata a                                     1401

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<210> 32

<211> 466

<212> PRT

<213> Streptococcus pneumoniae

<400> 32

Met Thr Ala Ile Asp Phe Thr Ala Glu Val Glu Lys Arg Lys Glu Asp
1 5 10 15

Leu Leu Ala Asp Leu Phe Ser Leu Leu Glu Ile Asn Ser Glu Arg Asp
20 25 30

Asp Ser Lys Ala Asp Ala Gln His Pro Phe Gly Pro Gly Pro Val Lys
35 40 45

Ala Leu Glu Lys Phe Leu Glu Ile Ala Asp Arg Asp Gly Tyr Pro Thr
50 55 60

Lys Asn Val Asp Asn Tyr Ala Gly His Phe Glu Phe Gly Asp Gly Glu
65 70 75 80

Glu Val Leu Gly Ile Phe Ala His Met Asp Val Val Pro Ala Gly Ser
85 90 95

Gly Trp Asp Thr Asp Pro Tyr Thr Pro Thr Ile Lys Asp Gly Arg Leu
100 105 110

Tyr Ala Arg Gly Ala Ser Asp Asp Lys Gly Pro Thr Thr Ala Cys Tyr
115 120 125

Tyr Gly Leu Lys Ile Ile Lys Glu Leu Gly Leu Pro Thr Ser Lys Lys
130 135 140

Val Arg Phe Ile Val Gly Thr Asp Glu Glu Ser Gly Trp Ala Asp Met

| | | | |
|---|-----|-----|-----|
| 145 | 150 | 155 | 160 |
| Asp Tyr Tyr Phe Glu His Val Gly Leu Ala Lys Pro Asp Phe Gly Phe | 165 | 170 | 175 |
| Ser Pro Asp Ala Glu Phe Pro Ile Ile Asn Gly Glu Lys Gly Asn Ile | 180 | 185 | 190 |
| Thr Glu Tyr Leu His Phe Ala Gly Glu Asn Thr Gly Val Ala Arg Leu | 195 | 200 | 205 |
| His Ser Phe Thr Gly Gly Leu Arg Glu Asn Met Val Pro Glu Ser Ala | 210 | 215 | 220 |
| Thr Ala Val Val Ser Gly Asp Leu Ala Asp Leu Gln Ala Lys Leu Asp | 225 | 230 | 235 |
| Ala Phe Val Ala Glu His Lys Leu Arg Gly Glu Leu Gln Glu Glu Ala | 245 | 250 | 255 |
| Gly Lys Tyr Lys Val Thr Ile Ile Gly Lys Ser Ala His Gly Ala Met | 260 | 265 | 270 |
| Pro Ala Ser Gly Val Asn Gly Ala Thr Tyr Leu Ala Leu Phe Leu Ser | 275 | 280 | 285 |
| Gln Phe Gly Phe Ala Gly Pro Ala Lys Asp Tyr Leu Asp Ile Ala Gly | 290 | 295 | 300 |
| Lys Ile Leu Leu Asn Asp His Glu Gly Glu Asn Leu Lys Ile Ala His | 305 | 310 | 315 |
| Val Asp Glu Lys Met Gly Ala Leu Ser Met Asn Ala Gly Val Phe His | 325 | 330 | 335 |
| Phe Asp Glu Thr Ser Ala Asp Asn Thr Ile Ala Leu Asn Ile Arg Tyr | 340 | 345 | 350 |
| Pro Lys Gly Thr Ser Pro Glu Gln Ile Lys Ser Ile Leu Glu Asn Leu | 355 | 360 | 365 |
| Pro Val Val Ser Val Ser Leu Ser Glu His Gly His Thr Pro His Tyr | 370 | 375 | 380 |
| Val Pro Met Glu Asp Pro Leu Val Gln Thr Leu Leu Asn Ile Tyr Glu | 385 | 390 | 395 |
| Lys Gln Thr Gly Phe Lys Gly His Glu Gln Val Ile Gly Gly Gly Thr | 405 | 410 | 415 |
| Phe Gly Arg Leu Leu Glu Arg Gly Val Ala Tyr Gly Ala Met Phe Pro | 420 | 425 | 430 |
| Asp Ser Ile Asp Thr Met His Gln Ala Asn Glu Phe Ile Ala Leu Asp | 435 | 440 | 445 |
| Asp Leu Phe Arg Ala Ala Ala Ile Tyr Ala Glu Ala Ile Tyr Glu Leu | | | |

450

455

460

Ile Lys

465

<210> 33

<211> 1617

<212> DNA

<213> Streptococcus pneumoniae

<400> 33

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attgcatga atttagagcg gtttttgaaa ttgtcaatct accaaatgat tgtctggtgt 180
gggataatat tccttgactg ggtagtgaata aattatcagg ttgaagtgat ccaagagttt 240
aatctagaga ttcgaaatag agttgccaca gacatctcta actctaccta tcaagaattt 300
catagtaaatt catcaggaac atatctttcg tggctaaata atgatgttca gacttttaaat 360
gatcaggcgt ttaaacaact ttttttagta ataaaaggaa tttctggtac tatatttgca 420
gttggtgactc ttaatcacta tcattggtca ttgactgtag ccaccttggt ttcattaatg 480
attatgctac ttgtacccaa aatctttgca tcgaaaatgc gagaagttag tctaaattta 540
actaaccaaa atgaagcttt tttaaaatct agtgagacta tattgaatgg atttgatgtg 600
ttagcgctct tgaatctttt atatgtattg cctaagaaaa ttaaagaagc aggaatttta 660
ttaaagatgg ttatacaaag aaagacaact gtagaaacgt tagcaggcgc tattagcttc 720
tttctcaata ttttttttca gatatctctc gtttttttaa caggctatct tgcaataaaa 780
ggaatagtga aaattggtac tattgaagca ataggagcac taacagggtgt tattttttaca 840
gcgctagggtg aattaggagg tcaattatcc tctattattg gtacgaagcc tattttttta 900
aaattgtatt caattaatcc aattgagtca aataaaatga atgatatcga accaaatgag 960
gtgaatagag attttccggt atatgaagca aaaaatattt gctataagta tggagataaa 1020
gaaatattaa aaaacttaaa tttttgtttt caacgtaatg aaaagtattt aatttttaggt 1080
gaaagtggaa gcgggaaatc tacattatta aaattattga atggcttttt gagagattat 1140
agtggagaat tgcgattctg cggggatgat ataaaaaaa cctcctattt aaatatggtt 1200
tcgaatgttc tatatgtaga tcaaaaagct tatttggttg aaggtagcat tagagataat 1260
attttattgg aagaaaatta tactgatgaa gaaatactac agtctttaga gcaagttggt 1320
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gaacgtaaga tattagatag agaggatttg actgtcatta ttgttaccba tgctccgcatt 1560
ccggaactta aacaatattt tactaagata tatcaatttc caaaggattt tatttaa 1617

```

<210> 34

<211> 538

<212> PRT

<213> Streptococcus pneumoniae

<400> 34

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Met Tyr Thr Ile Ile Lys Ser Asn Ile Lys Lys Phe Ser Leu Leu Thr
  1             5             10             15

Ile Phe Ile Val Ala Gly Gln Leu Leu Leu Ile Tyr Ala Ala Thr Ile
      20             25             30

Asn Ala Leu Val Leu Asn Glu Leu Ile Ala Met Asn Leu Glu Arg Phe
      35             40             45

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Leu Lys Leu Ser Ile Tyr Gln Met Ile Val Trp Cys Gly Ile Ile Phe
 50 55 60
 Leu Asp Trp Val Val Lys Asn Tyr Gln Val Glu Val Ile Gln Glu Phe
 65 70 75 80
 Asn Leu Glu Ile Arg Asn Arg Val Ala Thr Asp Ile Ser Asn Ser Thr
 85 90 95
 Tyr Gln Glu Phe His Ser Lys Ser Ser Gly Thr Tyr Leu Ser Trp Leu
 100 105 110
 Asn Asn Asp Val Gln Thr Leu Asn Asp Gln Ala Phe Lys Gln Leu Phe
 115 120 125
 Leu Val Ile Lys Gly Ile Ser Gly Thr Ile Phe Ala Val Val Thr Leu
 130 135 140
 Asn His Tyr His Trp Ser Leu Thr Val Ala Thr Leu Phe Ser Leu Met
 145 150 155 160
 Ile Met Leu Leu Val Pro Lys Ile Phe Ala Ser Lys Met Arg Glu Val
 165 170 175
 Ser Leu Asn Leu Thr Asn Gln Asn Glu Ala Phe Leu Lys Ser Ser Glu
 180 185 190
 Thr Ile Leu Asn Gly Phe Asp Val Leu Ala Ser Leu Asn Leu Leu Tyr
 195 200 205
 Val Leu Pro Lys Lys Ile Lys Glu Ala Gly Ile Leu Leu Lys Met Val
 210 215 220
 Ile Gln Arg Lys Thr Thr Val Glu Thr Leu Ala Gly Ala Ile Ser Phe
 225 230 235 240
 Phe Leu Asn Ile Phe Phe Gln Ile Ser Leu Val Phe Leu Thr Gly Tyr
 245 250 255
 Leu Ala Ile Lys Gly Ile Val Lys Ile Gly Thr Ile Glu Ala Ile Gly
 260 265 270
 Ala Leu Thr Gly Val Ile Phe Thr Ala Leu Gly Glu Leu Gly Gly Gln
 275 280 285
 Leu Ser Ser Ile Ile Gly Thr Lys Pro Ile Phe Leu Lys Leu Tyr Ser
 290 295 300
 Ile Asn Pro Ile Glu Ser Asn Lys Met Asn Asp Ile Glu Pro Asn Glu
 305 310 315 320
 Val Asn Arg Asp Phe Pro Leu Tyr Glu Ala Lys Asn Ile Cys Tyr Lys
 325 330 335
 Tyr Gly Asp Lys Glu Ile Leu Lys Asn Leu Asn Phe Cys Phe Gln Arg
 340 345 350

Asn Glu Lys Tyr Leu Ile Leu Gly Glu Ser Gly Ser Gly Lys Ser Thr
 355 360 365
 Leu Leu Lys Leu Leu Asn Gly Phe Leu Arg Asp Tyr Ser Gly Glu Leu
 370 375 380
 Arg Phe Cys Gly Asp Asp Ile Lys Lys Thr Ser Tyr Leu Asn Met Val
 385 390 395 400
 Ser Asn Val Leu Tyr Val Asp Gln Lys Ala Tyr Leu Phe Glu Gly Thr
 405 410 415
 Ile Arg Asp Asn Ile Leu Leu Glu Glu Asn Tyr Thr Asp Glu Glu Ile
 420 425 430
 Leu Gln Ser Leu Glu Gln Val Gly Leu Ser Val Lys Asp Phe Pro Asn
 435 440 445
 Asn Ile Leu Asp Tyr Tyr Val Gly Asp Asp Gly Arg Leu Leu Ser Gly
 450 455 460
 Gly Gln Lys Gln Lys Ile Thr Leu Ala Arg Gly Leu Ile Arg Asn Lys
 465 470 475 480
 Lys Ile Val Leu Ile Asp Glu Gly Thr Ser Ala Ile Asp Arg Arg Thr
 485 490 495
 Ser Leu Ala Ile Glu Arg Lys Ile Leu Asp Arg Glu Asp Leu Thr Val
 500 505 510
 Ile Ile Val Thr His Ala Pro His Pro Glu Leu Lys Gln Tyr Phe Thr
 515 520 525
 Lys Ile Tyr Gln Phe Pro Lys Asp Phe Ile
 530 535

<210> 35

<211> 705

<212> DNA

<213> Streptococcus pneumoniae

<400> 35

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 cgaaccaact cccttttgac taatgagcga tcaaatattg aaaaacaagc cctccaaacg 180
 gcagaaaaac aagaaatagc ccattttgca ggcagtctag tagaagaaag agaaactatt 240
 ttcattggac caggaacaac attagagttt tttgcgcgtg agttgcctat tgacaatatc 300
 cgcgtcgtaa ccaacagtct acctgtttt ctgattttta gcgaacgaaa attaacagat 360
 ttgattttta taggtggaaa ttatcgcgat attacaggtg cttttgttgg tacattgacc 420
 ctacaaaatc tctctaattc ccaattttct aaagctttcg ttagctgtaa tggatttcaa 480
 aacggagctc tagctacttt tagcggaggaa gagggagagg ctcaacgcat cgcttttaaat 540
 aattctaata aaaaatattt actcgcagat catagcaagt tcaataagtt tgatttttat 600
 actttttata atgtatcaaa tcttgatact attgtttcag attctaaact aagtgattca 660
 atccttttta agctatctaa acacattaaa gtcacaaagc cttaa 705

<210> 36
 <211> 234
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 36
 Ile Thr Val Lys Gln Ile Met Asp Glu Ile Ala Val Ser Asp Met Thr
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 Ala Arg Arg Tyr Leu Gln Glu Leu Ala Asp Lys Asp Leu Leu Ile Arg
 20 25 30
 Val His Gly Gly Ala Glu Lys Leu Arg Thr Asn Ser Leu Leu Thr Asn
 35 40 45
 Glu Arg Ser Asn Ile Glu Lys Gln Ala Leu Gln Thr Ala Glu Lys Gln
 50 55 60
 Glu Ile Ala His Phe Ala Gly Ser Leu Val Glu Glu Arg Glu Thr Ile
 65 70 75 80
 Phe Ile Gly Pro Gly Thr Thr Leu Glu Phe Phe Ala Arg Glu Leu Pro
 85 90 95
 Ile Asp Asn Ile Arg Val Val Thr Asn Ser Leu Pro Val Phe Leu Ile
 100 105 110
 Leu Ser Glu Arg Lys Leu Thr Asp Leu Ile Leu Ile Gly Gly Asn Tyr
 115 120 125
 Arg Asp Ile Thr Gly Ala Phe Val Gly Thr Leu Thr Leu Gln Asn Leu
 130 135 140
 Ser Asn Leu Gln Phe Ser Lys Ala Phe Val Ser Cys Asn Gly Ile Gln
 145 150 155 160
 Asn Gly Ala Leu Ala Thr Phe Ser Glu Glu Glu Gly Glu Ala Gln Arg
 165 170 175
 Ile Ala Leu Asn Asn Ser Asn Lys Lys Tyr Leu Leu Ala Asp His Ser
 180 185 190
 Lys Phe Asn Lys Phe Asp Phe Tyr Thr Phe Tyr Asn Val Ser Asn Leu
 195 200 205
 Asp Thr Ile Val Ser Asp Ser Lys Leu Ser Asp Ser Ile Leu Phe Lys
 210 215 220
 Leu Ser Lys His Ile Lys Val Ile Lys Pro
 225 230

<210> 37
 <211> 483
 <212> DNA

<213> Streptococcus pneumoniae

<400> 37

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caatccatct ttatcgaaca caagggaaat tatgcttata gccgggttca tttagaacta 180
agaaatcgtg gttatctggg aaatcataaa agagttcaag gcttgatgaa agtactcaat 240
ttacaagcta aaatgcgaaa gaaacgaaaa tattcttctc ataaaggaga cgttggtaag 300
aaggcagaga atctcattca agcccaattt gaaggctcta aaacaatgga aaagtgttac 360
acagatgtga ctgaatttgc cattccagca agtactcaaa agctttactt atcaccagtt 420
ttagatggct ttaacagcga aattattgct tttaatcttt cttgttcgcc taatttagaa 480
taa 483
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<210> 38

<211> 160

<212> PRT

<213> Streptococcus pneumoniae

<400> 38

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Met Thr Glu Phe Ser Leu Asp Leu Leu Glu Ala Ile Lys Leu Ala
 1              5              10              15

Arg Trp Thr Tyr Tyr Tyr His Leu Lys Gln Leu Asp Lys Thr Asp Lys
          20              25              30

Asp Gln Glu Leu Lys Thr Glu Ile Gln Ser Ile Phe Ile Glu His Lys
          35              40              45

Gly Asn Tyr Ala Tyr Arg Arg Val His Leu Glu Leu Arg Asn Arg Gly
          50              55              60

Tyr Leu Val Asn His Lys Arg Val Gln Gly Leu Met Lys Val Leu Asn
          65              70              75              80

Leu Gln Ala Lys Met Arg Lys Lys Arg Lys Tyr Ser Ser His Lys Gly
          85              90              95

Asp Val Gly Lys Lys Ala Glu Asn Leu Ile Gln Ala Gln Phe Glu Gly
          100              105              110

Ser Lys Thr Met Glu Lys Cys Tyr Thr Asp Val Thr Glu Phe Ala Ile
          115              120              125

Pro Ala Ser Thr Gln Lys Leu Tyr Leu Ser Pro Val Leu Asp Gly Phe
          130              135              140

Asn Ser Glu Ile Ile Ala Phe Asn Leu Ser Cys Ser Pro Asn Leu Glu
          145              150              155              160
```

<210> 39

<211> 1266

<212> DNA

<213> Streptococcus pneumoniae

<400> 39

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atcaatcaat cagcacattc agatatcaaa gttgctaagg tattgggtcaa ggatgaagat 120
gaaaaaaatc gcttgcttgc agcagggaat gactttaact ttgtaaccaa tgtgggatgat 180
attttatcag accaggatat tactatcgta gtggaattga tggggcgat tgagcctgct 240
aaaaccttta tcaactcgtgc cttggaagct ggaaaacacg ttgttactgc taacaaggac 300
cttttagctg tccatggcgc agaattgcta gaaatcgctc aagctaacaa ggtagcactt 360
tactacgaag cagcagttgc tgggtgggatt ccaattcttc gtacttttagc aaattccttg 420
gcttctgata aaattacgcg cgtgcttgga gtagtcaacg gaacttccaa cttcatgggtg 480
accaagatgg tggaagaagg ctgggtcttac gatgatgctc ttgcggaagc acaacgtcta 540
ggatttgcag aaagcgatcc gacgaatgac gtagatggga ttgatgcagc ctacaagatg 600
gttattttga gccaatttgc ctttggcatg aagattgcct ttgatgatgt agcccacaag 660
ggaatccgca atatcacacc agaagacgta gctgtagctc aagagcttgg ttacgtagtg 720
aaattgggtg gttctattga ggaaacttct tcaggtattg ctgcagaagt gactccaacc 780
ttcctaccta aagcgcaccc acttgctagt gtgaatggcg taatgaacgc tgtctttgta 840
gaatctatcg gtattgggtg gtctatgtac tacggaccag gtgcgggtca aaaaccaact 900
gcaacaagtg ttgtagctga tattgtccgt atcgttcgct gtttgaatga tgggtactatt 960
ggcaaagact tcaacgaata tagccgtgac ttggtcttgg caaatcctga agatgtcaaa 1020
gcaaactact atttctcaat cttggctcta gactcaaaag gtcaggtctt gaagttggct 1080
gaaatcttca atgtcaaga tatttccttt aagcaaatcc ttcaagatgg caaagagggt 1140
gacaaggcgc gtgtcggtat catcacacac aagattaata aagcccagct tgaaaatgct 1200
tcagctgaat tgaagaaggt ttcagaattc gacctcttga ataccttcaa ggtgctagga 1260
gaataa
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<210> 40

<211> 421

<212> PRT

<213> Streptococcus pneumoniae

<400> 40

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Pro Gly Phe Gly Thr Val Ala Ser Gly Val Pro Phe Leu Leu Lys Glu
  1                      5                      10                      15
```

```
Asn Gly Gly Lys Ile Asn Gln Ser Ala His Ser Asp Ile Lys Val Ala
      20                      25                      30
```

```
Lys Val Leu Val Lys Asp Glu Asp Glu Lys Asn Arg Leu Leu Ala Ala
      35                      40                      45
```

```
Gly Asn Asp Phe Asn Phe Val Thr Asn Val Asp Asp Ile Leu Ser Asp
      50                      55                      60
```

```
Gln Asp Ile Thr Ile Val Val Glu Leu Met Gly Arg Ile Glu Pro Ala
      65                      70                      75                      80
```

```
Lys Thr Phe Ile Thr Arg Ala Leu Glu Ala Gly Lys His Val Val Thr
      85                      90                      95
```

```
Ala Asn Lys Asp Leu Leu Ala Val His Gly Ala Glu Leu Leu Glu Ile
      100                      105                      110
```

```
Ala Gln Ala Asn Lys Val Ala Leu Tyr Tyr Glu Ala Ala Val Ala Gly
      115                      120                      125
```

Gly Ile Pro Ile Leu Arg Thr Leu Ala Asn Ser Leu Ala Ser Asp Lys
 130 135 140
 Ile Thr Arg Val Leu Gly Val Val Asn Gly Thr Ser Asn Phe Met Val
 145 150 155 160
 Thr Lys Met Val Glu Gly Trp Ser Tyr Asp Asp Ala Leu Ala Glu
 165 170 175
 Ala Gln Arg Leu Gly Phe Ala Glu Ser Asp Pro Thr Asn Asp Val Asp
 180 185 190
 Gly Ile Asp Ala Ala Tyr Lys Met Val Ile Leu Ser Gln Phe Ala Phe
 195 200 205
 Gly Met Lys Ile Ala Phe Asp Asp Val Ala His Lys Gly Ile Arg Asn
 210 215 220
 Ile Thr Pro Glu Asp Val Ala Val Ala Gln Glu Leu Gly Tyr Val Val
 225 230 235 240
 Lys Leu Val Gly Ser Ile Glu Glu Thr Ser Ser Gly Ile Ala Ala Glu
 245 250 255
 Val Thr Pro Thr Phe Leu Pro Lys Ala His Pro Leu Ala Ser Val Asn
 260 265 270
 Gly Val Met Asn Ala Val Phe Val Glu Ser Ile Gly Ile Gly Glu Ser
 275 280 285
 Met Tyr Tyr Gly Pro Gly Ala Gly Gln Lys Pro Thr Ala Thr Ser Val
 290 295 300
 Val Ala Asp Ile Val Arg Ile Val Arg Arg Leu Asn Asp Gly Thr Ile
 305 310 315 320
 Gly Lys Asp Phe Asn Glu Tyr Ser Arg Asp Leu Val Leu Ala Asn Pro
 325 330 335
 Glu Asp Val Lys Ala Asn Tyr Tyr Phe Ser Ile Leu Ala Leu Asp Ser
 340 345 350
 Lys Gly Gln Val Leu Lys Leu Ala Glu Ile Phe Asn Ala Gln Asp Ile
 355 360 365
 Ser Phe Lys Gln Ile Leu Gln Asp Gly Lys Glu Gly Asp Lys Ala Arg
 370 375 380
 Val Val Ile Ile Thr His Lys Ile Asn Lys Ala Gln Leu Glu Asn Val
 385 390 395 400
 Ser Ala Glu Leu Lys Lys Val Ser Glu Phe Asp Leu Leu Asn Thr Phe
 405 410 415
 Lys Val Leu Gly Glu
 420

<210> 41
 <211> 1725
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 41
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 gaccaatctt tacctcaggg agatcaagg catctctgga tgcagattgg cctgctcctt 180
 atctttgcag taattggcgt tttagtggcc ttgatagctc aattttactc agcaaaggca 240
 gcagtaggtt ctgctaagga attgacaaac gatctttatc gtcataattct ttccttgccc 300
 aaggacagca gagaccgtct gacaacttct agtttgggtc ctgcgttgac ttcggatacc 360
 taccagattc agactggtat caatcaattc ctgcgtctct ttttacgagc gccattatc 420
 gtttttgggtg ccatttttat ggcttatcga atctcagctg agttgacttt ctggttctta 480
 gtcttgggtt ccattttgac cattgtcatt gtagggttat ctcgattggg caatcctttc 540
 tacagtagtc tcagaaagaa aacggacca ctggttcagg aaacgcgcca gcaattgcaa 600
 gggatgcggg ttattcgtgc ttttgggtcaa gaaaaacgag agttacagat ttttcaaacc 660
 cttaccaag tttatgctag attacaagaa aagacagggt tctgggtctag tttattaaca 720
 cctctgacct atctgattgt caatggaact cttctcgtaa ttatctggca aggctatatt 780
 tcaattcaag gaggagtgt cagtcaagg gctctcattg ctcttatcaa ttacctctta 840
 cagatttttg tgggaattgg caagctagcc atgttgatca attccctcaa ccagtcctat 900
 atctcagtca agcgaatcga ggaagtcttt gttgaggctc cagaggatat ccattcagag 960
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 aatttggagc agtggcggtc ttggattgcc tatgtacctc aaaaggctga actctttaaa 1260
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 gatgctctag ttgaggcagg ggggcgaaat ttctcagggt gacaaaaaca aagattgtct 1440
 atcgcccgag cagtcttgcg ccaggctccg tttctcatcc tagatgatgc aacctcggca 1500
 ctggatacca ttacagagtc caagctcttg aaagctatta gagaaaattt tccaaacacg 1560
 agcttaattt tgatctctca acgaacctca actttacaga tggcggacca gattctcctc 1620
 ttggaaaaag gtgagttgct agctgttggc aagcacgatg acttgatgaa atccagccaa 1680
 gtctattgtg aaatcaatgc atcccaacat ggaaaggagg actag 1725

<210> 42
 <211> 574
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 42
 Met Lys His Leu Leu Ser Tyr Phe Lys Pro Tyr Ile Lys Glu Ser Ile
 1 5 10 15
 Leu Ala Pro Leu Phe Lys Leu Leu Glu Ala Val Phe Glu Leu Leu Val
 20 25 30
 Pro Met Val Ile Ala Gly Ile Val Asp Gln Ser Leu Pro Gln Gly Asp
 35 40 45
 Gln Gly His Leu Trp Met Gln Ile Gly Leu Leu Leu Ile Phe Ala Val
 50 55 60

Ile Gly Val Leu Val Ala Leu Ile Ala Gln Phe Tyr Ser Ala Lys Ala
 65 70 75 80
 Ala Val Gly Ser Ala Lys Glu Leu Thr Asn Asp Leu Tyr Arg His Ile
 85 90 95
 Leu Ser Leu Pro Lys Asp Ser Arg Asp Arg Leu Thr Thr Ser Ser Leu
 100 105 110
 Val Thr Arg Leu Thr Ser Asp Thr Tyr Gln Ile Gln Thr Gly Ile Asn
 115 120 125
 Gln Phe Leu Arg Leu Phe Leu Arg Ala Pro Ile Ile Val Phe Gly Ala
 130 135 140
 Ile Phe Met Ala Tyr Arg Ile Ser Ala Glu Leu Thr Phe Trp Phe Leu
 145 150 155 160
 Val Leu Val Ala Ile Leu Thr Ile Val Ile Val Gly Leu Ser Arg Leu
 165 170 175
 Val Asn Pro Phe Tyr Ser Ser Leu Arg Lys Lys Thr Asp Gln Leu Val
 180 185 190
 Gln Glu Thr Arg Gln Gln Leu Gln Gly Met Arg Val Ile Arg Ala Phe
 195 200 205
 Gly Gln Glu Lys Arg Glu Leu Gln Ile Phe Gln Thr Leu Asn Gln Val
 210 215 220
 Tyr Ala Arg Leu Gln Glu Lys Thr Gly Phe Trp Ser Ser Leu Leu Thr
 225 230 235 240
 Pro Leu Thr Tyr Leu Ile Val Asn Gly Thr Leu Leu Val Ile Ile Trp
 245 250 255
 Gln Gly Tyr Ile Ser Ile Gln Gly Gly Val Leu Ser Gln Gly Ala Leu
 260 265 270
 Ile Ala Leu Ile Asn Tyr Leu Leu Gln Ile Leu Val Glu Leu Val Lys
 275 280 285
 Leu Ala Met Leu Ile Asn Ser Leu Asn Gln Ser Tyr Ile Ser Val Lys
 290 295 300
 Arg Ile Glu Glu Val Phe Val Glu Ala Pro Glu Asp Ile His Ser Glu
 305 310 315 320
 Leu Glu Gln Lys Gln Ala Thr Arg Asp Lys Val Leu Gln Val Gln Glu
 325 330 335
 Leu Thr Phe Thr Tyr Pro Asp Ala Ala Gln Pro Ser Leu Arg Tyr Ile
 340 345 350
 Ser Phe Asp Met Thr Gln Gly Gln Ile Leu Gly Ile Ile Gly Gly Thr
 355 360 365

Gly Ser Gly Lys Ser Ser Leu Val Gln Leu Leu Leu Gly Leu Tyr Pro
 370 375 380
 Val Asp Lys Gly Asn Ile Asp Leu Tyr Gln Asn Gly Arg Ser Pro Leu
 385 390 395 400
 Asn Leu Glu Gln Trp Arg Ser Trp Ile Ala Tyr Val Pro Gln Lys Val
 405 410 415
 Glu Leu Phe Lys Gly Thr Ile Arg Ser Asn Leu Thr Leu Gly Phe Asn
 420 425 430
 Gln Glu Val Ser Asp Gln Glu Leu Trp Gln Ala Leu Glu Ile Ala Gln
 435 440 445
 Ala Lys Asp Phe Val Ser Glu Lys Glu Gly Leu Leu Asp Ala Leu Val
 450 455 460
 Glu Ala Gly Gly Arg Asn Phe Ser Gly Gly Gln Lys Gln Arg Leu Ser
 465 470 475 480
 Ile Ala Arg Ala Val Leu Arg Gln Ala Pro Phe Leu Ile Leu Asp Asp
 485 490 495
 Ala Thr Ser Ala Leu Asp Thr Ile Thr Glu Ser Lys Leu Leu Lys Ala
 500 505 510
 Ile Arg Glu Asn Phe Pro Asn Thr Ser Leu Ile Leu Ile Ser Gln Arg
 515 520 525
 Thr Ser Thr Leu Gln Met Ala Asp Gln Ile Leu Leu Leu Glu Lys Gly
 530 535 540
 Glu Leu Leu Ala Val Gly Lys His Asp Asp Leu Met Lys Ser Ser Gln
 545 550 555 560
 Val Tyr Cys Glu Ile Asn Ala Ser Gln His Gly Lys Glu Asp
 565 570

<210> 43

<211> 1224

<212> DNA

<213> Streptococcus pneumoniae

<400> 43

atgaaacggt ctctcgactc aagagtcgat tacagtttgc tcttgccagt attttttcta 60
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 ctgcccattt tagggcagca ggtcgccctgg attgccttgg ggcttgtgat tggttttgtg 180
 gtcattgctt ttaatacaga atttctttgg aagggtgacc cctttctata tatttttaggc 240
 ttgggactta tgatcttgcc gattgtattt tataatccaa gcttagttgc atcaacgggt 300
 gccaaaaact gggatatcaat aaatggaatt accctattcc aaccgtcaga atttatgaag 360
 atatcctata tcctcatggt ggctcggtgc attgtccaat ttacaaagaa acataaggaa 420
 tggagacgca cggttccgct ggactttttg ttaattttct ggatgattct ctttaccatt 480
 ccagtcctag ttcttttagc acttcaaagt gacttgggga cggctttggt tttttagacc 540

```

attttctcag gaatcgtttt attatcaggg gtttcttggg aaattattat cccagtattt 600
gtgactgctg taacaggagt tgctggtttc ttagctatct ttattagcaa ggacggacga 660
gcttttcttc accagattgg aatgccgacc taccaaatta atcggatttt ggcttggctc 720
aatccctttg agtttgccca aacaacgact taccagcagg ctcaagggca gattgccatt 780
gggagtggtg gcttatttgg tcagggattt aatgcttcga atctgcttat cccagttcga 840
gagtcagata tgatttttac ggttattgca gaagattttg gctttattgg ctctgtcctg 900
gttattgccc tctatctcat gttgatttac cgtatgttga agattactct taaatcaa 960
aaccagttct acacttatat ttccacaggt ttgattatga tgttgctctt ccacatcttt 1020
gagaatatcg gtgctgtgac tggactactt cctttgacgg ggattccctt gcctttcatt 1080
tcgcaagggg gatcagctat tatcagtaat ctgattggtg ttggtttgc tttatcgatg 1140
agttaccaga ctaatctagc tgaagaaaag agcggaaaag tccattcaa acggaaaaag 1200
gttgtattaa aacaaattaa ataa 1224

```

<210> 44

<211> 407

<212> PRT

<213> Streptococcus pneumoniae

<400> 44

```

Met Lys Arg Ser Leu Asp Ser Arg Val Asp Tyr Ser Leu Leu Leu Pro
  1              5              10              15

```

```

Val Phe Phe Leu Leu Val Ile Gly Val Val Ala Ile Tyr Ile Ala Val
      20              25              30

```

```

Ser His Asp Tyr Pro Asn Asn Ile Leu Pro Ile Leu Gly Gln Gln Val
      35              40              45

```

```

Ala Trp Ile Ala Leu Gly Leu Val Ile Gly Phe Val Val Met Leu Phe
      50              55              60

```

```

Asn Thr Glu Phe Leu Trp Lys Val Thr Pro Phe Leu Tyr Ile Leu Gly
      65              70              75              80

```

```

Leu Gly Leu Met Ile Leu Pro Ile Val Phe Tyr Asn Pro Ser Leu Val
      85              90              95

```

```

Ala Ser Thr Gly Ala Lys Asn Trp Val Ser Ile Asn Gly Ile Thr Leu
      100             105             110

```

```

Phe Gln Pro Ser Glu Phe Met Lys Ile Ser Tyr Ile Leu Met Leu Ala
      115             120             125

```

```

Arg Val Ile Val Gln Phe Thr Lys Lys His Lys Glu Trp Arg Arg Thr
      130             135             140

```

```

Val Pro Leu Asp Phe Leu Leu Ile Phe Trp Met Ile Leu Phe Thr Ile
      145             150             155             160

```

```

Pro Val Leu Val Leu Leu Ala Leu Gln Ser Asp Leu Gly Thr Ala Leu
      165             170             175

```

```

Val Phe Val Ala Ile Phe Ser Gly Ile Val Leu Leu Ser Gly Val Ser
      180             185             190

```

```

Trp Lys Ile Ile Ile Pro Val Phe Val Thr Ala Val Thr Gly Val Ala

```



```

atcaaggaag tttatccaga ttatacttct aaattacaga caatctacaa tggatatgat 540
tttcagacta ttctagaaaa atctcaagag aagatcgata tcgagattgc tcctcaaagt 600
atctgtacta tcggacggat tgaggaaaat aagggttctg accgtgtagt ggaagtgata 660
cgattattac accaagaggg aaaaaactat catctctatt ttatcggggc tggatgatg 720
gaagaggaac tgaaaaaacg agtcaaagag tatgggattg aggactatgt acatttcctt 780
ggttatcaaa aaaatcctta tcagtatcta tctcagacga aagttctttt gtctatgtct 840
aaacaagaag gttttccttg agtgtatgtg gaggccttga gtctgggact cccttttatt 900
tctacggacg ttggaggggc tgaggaatta tccaagaag gacgatttgg acaaatacatt 960
gagagcaatc aagaggcagc tcaggcgatt actaattaca tgacttctgc ctcaaacttt 1020
gatgtcgatg aggctagcca attcattcaa caatttaciaa ttacaaaaca aatcgaacaa 1080
gtagaaaaac tattagagga gtag                                     1104

```

<210> 46

<211> 367

<212> PRT

<213> Streptococcus pneumoniae

<400> 46

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Met Val Ala Lys Lys Lys Ile Leu Phe Phe Met Trp Ser Phe Ser Leu
  1              5              10              15

```

```

Gly Gly Gly Ala Glu Lys Ile Leu Ser Thr Ile Val Ser Asn Leu Asp
      20              25              30

```

```

Pro Glu Lys Tyr Asp Ile Asp Ile Leu Glu Met Glu His Phe Asp Lys
      35              40              45

```

```

Gly Tyr Glu Ser Val Pro Lys His Val Arg Ile Leu Lys Ser Leu Gln
      50              55              60

```

```

Asp Tyr Arg Gln Thr Arg Trp Leu Arg Ala Phe Leu Trp Arg Met Arg
      65              70              75              80

```

```

Ile Tyr Phe Pro Arg Leu Thr Arg Arg Leu Leu Val Lys Asp Asp Tyr
      85              90              95

```

```

Asp Val Glu Val Ser Phe Thr Ile Met Asn Pro Pro Leu Leu Phe Ser
     100              105              110

```

```

Lys Arg Arg Glu Val Lys Lys Ile Ser Trp Ile His Gly Ser Ile Glu
     115              120              125

```

```

Glu Leu Leu Lys Asp Ser Ser Lys Arg Glu Ser His Arg Ser Gln Leu
     130              135              140

```

```

Asp Ala Ala Asn Thr Ile Val Gly Ile Ser Lys Lys Thr Ser Asn Ser
     145              150              155              160

```

```

Ile Lys Glu Val Tyr Pro Asp Tyr Thr Ser Lys Leu Gln Thr Ile Tyr
     165              170              175

```

```

Asn Gly Tyr Asp Phe Gln Thr Ile Leu Glu Lys Ser Gln Glu Lys Ile
     180              185              190

```

```

Asp Ile Glu Ile Ala Pro Gln Ser Ile Cys Thr Ile Gly Arg Ile Glu
     195              200              205

```

Glu Asn Lys Gly Ser Asp Arg Val Val Glu Val Ile Arg Leu Leu His
 210 215 220
 Gln Glu Gly Lys Asn Tyr His Leu Tyr Phe Ile Gly Ala Gly Asp Met
 225 230 235 240
 Glu Glu Glu Leu Lys Lys Arg Val Lys Glu Tyr Gly Ile Glu Asp Tyr
 245 250 255
 Val His Phe Leu Gly Tyr Gln Lys Asn Pro Tyr Gln Tyr Leu Ser Gln
 260 265 270
 Thr Lys Val Leu Leu Ser Met Ser Lys Gln Glu Gly Phe Pro Gly Val
 275 280 285
 Tyr Val Glu Ala Leu Ser Leu Gly Leu Pro Phe Ile Ser Thr Asp Val
 290 295 300
 Gly Gly Ala Glu Glu Leu Ser Gln Glu Gly Arg Phe Gly Gln Ile Ile
 305 310 315 320
 Glu Ser Asn Gln Glu Ala Ala Gln Ala Ile Thr Asn Tyr Met Thr Ser
 325 330 335
 Ala Ser Asn Phe Asp Val Asp Glu Ala Ser Gln Phe Ile Gln Gln Phe
 340 345 350
 Thr Ile Thr Lys Gln Ile Glu Gln Val Glu Lys Leu Leu Glu Glu
 355 360 365

<210> 47
 <211> 987
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 47
 atggaaactg cattaattag tgtgattgtg ccagtctata atgtggcgca gtacctagaa 60
 aaatcgatag cttccattca gaagcagacc tatcaaaatc tggaaattat tcttggtgat 120
 gatggtgcaa cagatgaaag tggtcgcttg tgtgattcaa tcgctgaaca agatgacagg 180
 gtgtcagtgc ttcataaaaa gaacgaagga ttgtcgcaag cacgaaatga tgggatgaag 240
 caggctcacg gggattatct gatttttatt gactcagatg attatatcca tccagaaatg 300
 attcagagct tatatgagca attagttcaa gaagatgcgg atgtttcgag ctgtggtgtc 360
 atgaatgtct atgctaataga tgaaagccca cagtcagcca atcaggatga ctattttgtc 420
 tgtgattctc aaacattttct aaaggaatac ctcatagggtg aaaaaatacc tgggacgatt 480
 tgcaataagc taatcaagag acagattgca actgcctat cctttcctaa ggggttgatt 540
 tacgaagatg cctattacca ttttgattta atcaagttgg ccaagaagta tgtgggtaat 600
 actaaaccct attattacta tttccataga ggggatagta ttacgaccaa accctatgca 660
 gagaaggatt tagcctatat tgatatctac caaaagtttt ataatgaagt tgtgaaaaac 720
 tatcctgact tgaaagaggt cgcttttttc agattggcct atgcccactt ctttattctg 780
 gataagatgt tgctagatga tcagtataaa cagtttgaag cctattctca gattcatcgt 840
 tttttaaaag gccatgcctt tgctattttct aggaatccaa ttttccgtaa ggggagaaga 900
 attagtgtct tggccctatt cataaatatt tccttatatc gattcttatt actgaaaaat 960
 attgaaaaat ctaaaaaatt acattag 987

<210> 48
 <211> 328
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 48
 Met Glu Thr Ala Leu Ile Ser Val Ile Val Pro Val Tyr Asn Val Ala
 1 5 10 15
 Gln Tyr Leu Glu Lys Ser Ile Ala Ser Ile Gln Lys Gln Thr Tyr Gln
 20 25 30
 Asn Leu Glu Ile Ile Leu Val Asp Asp Gly Ala Thr Asp Glu Ser Gly
 35 40 45
 Arg Leu Cys Asp Ser Ile Ala Glu Gln Asp Asp Arg Val Ser Val Leu
 50 55 60
 His Lys Lys Asn Glu Gly Leu Ser Gln Ala Arg Asn Asp Gly Met Lys
 65 70 75 80
 Gln Ala His Gly Asp Tyr Leu Ile Phe Ile Asp Ser Asp Asp Tyr Ile
 85 90 95
 His Pro Glu Met Ile Gln Ser Leu Tyr Glu Gln Leu Val Gln Glu Asp
 100 105 110
 Ala Asp Val Ser Ser Cys Gly Val Met Asn Val Tyr Ala Asn Asp Glu
 115 120 125
 Ser Pro Gln Ser Ala Asn Gln Asp Asp Tyr Phe Val Cys Asp Ser Gln
 130 135 140
 Thr Phe Leu Lys Glu Tyr Leu Ile Gly Glu Lys Ile Pro Gly Thr Ile
 145 150 155 160
 Cys Asn Lys Leu Ile Lys Arg Gln Ile Ala Thr Ala Leu Ser Phe Pro
 165 170 175
 Lys Gly Leu Ile Tyr Glu Asp Ala Tyr Tyr His Phe Asp Leu Ile Lys
 180 185 190
 Leu Ala Lys Lys Tyr Val Val Asn Thr Lys Pro Tyr Tyr Tyr Tyr Phe
 195 200 205
 His Arg Gly Asp Ser Ile Thr Thr Lys Pro Tyr Ala Glu Lys Asp Leu
 210 215 220
 Ala Tyr Ile Asp Ile Tyr Gln Lys Phe Tyr Asn Glu Val Val Lys Asn
 225 230 235 240
 Tyr Pro Asp Leu Lys Glu Val Ala Phe Phe Arg Leu Ala Tyr Ala His
 245 250 255
 Phe Phe Ile Leu Asp Lys Met Leu Leu Asp Asp Gln Tyr Lys Gln Phe
 260 265 270

Glu Ala Tyr Ser Gln Ile His Arg Phe Leu Lys Gly His Ala Phe Ala
 275 280 285

Ile Ser Arg Asn Pro Ile Phe Arg Lys Gly Arg Arg Ile Ser Ala Leu
 290 295 300

Ala Leu Phe Ile Asn Ile Ser Leu Tyr Arg Phe Leu Leu Leu Lys Asn
 305 310 315 320

Ile Glu Lys Ser Lys Lys Leu His
 325

<210> 49
 <211> 735
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 49
 atgagaatca aagagaaaac caataatatt aatggaggaa taaaaaatgt aagtaagcat 60
 tatggtcatt caatcattct caaagatata aattttgcac ttaacaaggg tgaaattggt 120
 ggtctagcag ggagaaatgg agttggtaag agtacgttga tgaaaattct tggttcagaat 180
 aatcaaccga cttcaggtaa tattataagc agtgataatg ttgggtattt aatcgaagaa 240
 ccaaaattat ttttatctaa aacagggtta gagaatttaa aatatttgtc aaatttatat 300
 ggtgttgact acaatcaaga aagattttaga tgtttgatcc aagagttaga tttgactcag 360
 tctattaata aaaaagtaaa gacctattct ttgggtacaa aacaaaaatt agctttgctt 420
 ctaactctcg ttacggaacc tgatatattg attttagatg aaccgactaa tggtttagat 480
 attgaatcat cacaaatagt ttttagcgggt ctaaaaaaat tagctttaca tgaaaatgtg 540
 ggaattttta tatcgagtca taaattagaa gacattgaag aaatttgtga gagagttctt 600
 ttcttgagaga acgggctttt gacatttcaa aaagtaggaa aagatagtca taatttcttg 660
 tttgagatag ctttttcatt agctacagat agagacattt tcattaccaa acaagaattt 720
 tgggatattg ttttag 735

<210> 50
 <211> 244
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 50
 Met Arg Ile Lys Glu Lys Thr Asn Asn Ile Asn Gly Gly Ile Lys Asn
 1 5 10 15

Val Ser Lys His Tyr Gly His Ser Ile Ile Leu Lys Asp Ile Asn Phe
 20 25 30

Ala Leu Asn Lys Gly Glu Ile Val Gly Leu Ala Gly Arg Asn Gly Val
 35 40 45

Gly Lys Ser Thr Leu Met Lys Ile Leu Val Gln Asn Asn Gln Pro Thr
 50 55 60

Ser Gly Asn Ile Ile Ser Ser Asp Asn Val Gly Tyr Leu Ile Glu Glu
 65 70 75 80

Pro Lys Leu Phe Leu Ser Lys Thr Gly Leu Glu Asn Leu Lys Tyr Leu
 85 90 95
 Ser Asn Leu Tyr Gly Val Asp Tyr Asn Gln Glu Arg Phe Arg Cys Leu
 100 105 110
 Ile Gln Glu Leu Asp Leu Thr Gln Ser Ile Asn Lys Lys Val Lys Thr
 115 120 125
 Tyr Ser Leu Gly Thr Lys Gln Lys Leu Ala Leu Leu Leu Thr Leu Val
 130 135 140
 Thr Glu Pro Asp Ile Leu Ile Leu Asp Glu Pro Thr Asn Gly Leu Asp
 145 150 155 160
 Ile Glu Ser Ser Gln Ile Val Leu Ala Val Leu Lys Lys Leu Ala Leu
 165 170 175
 His Glu Asn Val Gly Ile Leu Ile Ser Ser His Lys Leu Glu Asp Ile
 180 185 190
 Glu Glu Ile Cys Glu Arg Val Leu Phe Leu Glu Asn Gly Leu Leu Thr
 195 200 205
 Phe Gln Lys Val Gly Lys Asp Ser His Asn Phe Leu Phe Glu Ile Ala
 210 215 220
 Phe Ser Ser Ala Thr Asp Arg Asp Ile Phe Ile Thr Lys Gln Glu Phe
 225 230 235 240
 Trp Asp Ile Val

<210> 51
 <211> 1704
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 51
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 aaccgtgcta tgcttcgtgc gactgggtatg acagataagg actttgaaac atcgattgtg 120
 ggagtgattt cgacttgggc ggaaaataca ccatgtaaca ttcacttgca tgatttcggg 180
 aaactggcta aagaagggtgt caaatctgca ggcgcttgcc ctgtacagtt tggaaccatt 240
 accgtacggc acgggatcgc tatgggaacg cctgggtatgc gtttctctct aacatctcgt 300
 gacatcatcg cggactccat cgaggcggct atgagtggtc acaacgtgga tgccttcgtc 360
 gctatcgggt gctgtgacaa gaacatgcct ggatctatga ttgctattgc taatatggat 420
 atcccagcta ttttcgccta tgggtggaact attgcaccgg gaaatcttga tggtaaagat 480
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 gaggacgtga aacgtcttga atgtaatgcc tgccctggcc ctggtgggtg tgggtggatg 600
 tatactgcta ataccatggc aactgctatc gaagtcttag ggatgagttt gccaggggtca 660
 tcctctcacc cagctgaatc agctgataag aaagaagata tcgaagcagc aggacgtgct 720
 gttgttaaga tgttggaact tgggtctcaaa ccatcagata tcttgactcg tgaagccttt 780
 gaagatgcta tcaactgtaac gatggctctc ggtggttcta caaacgccac tcttcacttg 840
 ctgcgcattg cccatgccgc aaatgttgac ttgtcacttg aggacttcaa tacgattcaa 900
 gaacgtgtgc ctcaactggc cgacttgaaa ccatctgggtc agtatgtctt ccaagacctc 960


```

tacgaagtcg gtggtgtccc tgcggttatg aagtatttgt tggcaaattg tttccttcac 1020
ggagatcgca tcacatgtac tggttaagact gtagctgaaa acttggtga ctttgcagac 1080
ttgactccag gccaaaaagt tatcatgccca cttgaaaatc caaaacgtgc ggatgggtccg 1140
cttatcatct tgaacgggaa ccttgctcct gacgggtgcag ttgccaaggt atcaggtgtt 1200
aaagtgcgtc gtcacgttgg gccagctaag gtctttgact cagaagaaga tgcgattcag 1260
gccgttctga cagatgaaat cgttgatggc gatgtagtcg ttgttcgttt tgttggacct 1320
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cagggagata aggtggccct cttgacggac ggacgtttct ctggtggtac ttatggtctg 1440
gttgttggac atatcgctcc tgaagctcag gatggtggac caattgccta tctccgtacc 1500
ggcgatatcg ttacggttga ccaagatacc aaagaaattt ctatggccgt atccgaagaa 1560
gaacttgaaa aacgcaaggc agaaacaacc ttgccaccac tttacagccg tgggtgtcctc 1620
ggtaaataatg cccacatcgt atcatctgct tcacgcggag ccgtgacaga cttctggaat 1680
atggacaagt caggtaaaaa ataa 1704

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<210> 52

<211> 567

<212> PRT

<213> Streptococcus pneumoniae

<400> 52

```

Met Thr Glu Leu Asp Lys Arg His Arg Ser Ser Ile Tyr Asp Ser Met
  1              5              10              15

```

```

Val Lys Ser Pro Asn Arg Ala Met Leu Arg Ala Thr Gly Met Thr Asp
      20              25              30

```

```

Lys Asp Phe Glu Thr Ser Ile Val Gly Val Ile Ser Thr Trp Ala Glu
      35              40              45

```

```

Asn Thr Pro Cys Asn Ile His Leu His Asp Phe Gly Lys Leu Ala Lys
      50              55              60

```

```

Glu Gly Val Lys Ser Ala Gly Ala Trp Pro Val Gln Phe Gly Thr Ile
      65              70              75              80

```

```

Thr Val Ala Asp Gly Ile Ala Met Gly Thr Pro Gly Met Arg Phe Ser
      85              90              95

```

```

Leu Thr Ser Arg Asp Ile Ile Ala Asp Ser Ile Glu Ala Ala Met Ser
      100             105             110

```

```

Gly His Asn Val Asp Ala Phe Val Ala Ile Gly Gly Cys Asp Lys Asn
      115             120             125

```

```

Met Pro Gly Ser Met Ile Ala Ile Ala Asn Met Asp Ile Pro Ala Ile
      130             135             140

```

```

Phe Ala Tyr Gly Gly Thr Ile Ala Pro Gly Asn Leu Asp Gly Lys Asp
      145             150             155             160

```

```

Ile Asp Leu Val Ser Val Phe Glu Gly Ile Gly Lys Trp Asn His Gly
      165             170             175

```

```

Asp Met Thr Ala Glu Asp Val Lys Arg Leu Glu Cys Asn Ala Cys Pro
      180             185             190

```

Gly Pro Gly Gly Cys Gly Gly Met Tyr Thr Ala Asn Thr Met Ala Thr
 195 200 205
 Ala Ile Glu Val Leu Gly Met Ser Leu Pro Gly Ser Ser Ser His Pro
 210 215 220
 Ala Glu Ser Ala Asp Lys Lys Glu Asp Ile Glu Ala Ala Gly Arg Ala
 225 230 235 240
 Val Val Lys Met Leu Glu Leu Gly Leu Lys Pro Ser Asp Ile Leu Thr
 245 250 255
 Arg Glu Ala Phe Glu Asp Ala Ile Thr Val Thr Met Ala Leu Gly Gly
 260 265 270
 Ser Thr Asn Ala Thr Leu His Leu Leu Ala Ile Ala His Ala Ala Asn
 275 280 285
 Val Asp Leu Ser Leu Glu Asp Phe Asn Thr Ile Gln Glu Arg Val Pro
 290 295 300
 His Leu Ala Asp Leu Lys Pro Ser Gly Gln Tyr Val Phe Gln Asp Leu
 305 310 315 320
 Tyr Glu Val Gly Gly Val Pro Ala Val Met Lys Tyr Leu Leu Ala Asn
 325 330 335
 Gly Phe Leu His Gly Asp Arg Ile Thr Cys Thr Gly Lys Thr Val Ala
 340 345 350
 Glu Asn Leu Ala Asp Phe Ala Asp Leu Thr Pro Gly Gln Lys Val Ile
 355 360 365
 Met Pro Leu Glu Asn Pro Lys Arg Ala Asp Gly Pro Leu Ile Ile Leu
 370 375 380
 Asn Gly Asn Leu Ala Pro Asp Gly Ala Val Ala Lys Val Ser Gly Val
 385 390 395 400
 Lys Val Arg Arg His Val Gly Pro Ala Lys Val Phe Asp Ser Glu Glu
 405 410 415
 Asp Ala Ile Gln Ala Val Leu Thr Asp Glu Ile Val Asp Gly Asp Val
 420 425 430
 Val Val Val Arg Phe Val Gly Pro Lys Gly Gly Pro Gly Met Pro Glu
 435 440 445
 Met Leu Ser Leu Ser Ser Met Ile Val Gly Lys Gly Gln Gly Asp Lys
 450 455 460
 Val Ala Leu Leu Thr Asp Gly Arg Phe Ser Gly Gly Thr Tyr Gly Leu
 465 470 475 480
 Val Val Gly His Ile Ala Pro Glu Ala Gln Asp Gly Gly Pro Ile Ala
 485 490 495

Tyr Leu Arg Thr Gly Asp Ile Val Thr Val Asp Gln Asp Thr Lys Glu
 500 505 510
 Ile Ser Met Ala Val Ser Glu Glu Glu Leu Glu Lys Arg Lys Ala Glu
 515 520 525
 Thr Thr Leu Pro Pro Leu Tyr Ser Arg Gly Val Leu Gly Lys Tyr Ala
 530 535 540
 His Ile Val Ser Ser Ala Ser Arg Gly Ala Val Thr Asp Phe Trp Asn
 545 550 555 560
 Met Asp Lys Ser Gly Lys Lys
 565

<210> 53
 <211> 274
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 53
 atgttataat aaaaataaag aatttaagga gaaatacaat atgtcaattt ttattggagg 60
 agcatggcca tatgcaaacg gttcgttaca tattgggtcac gcggcagcgc ttttaccggg 120
 ggatattctt gcaagatact atcgtcagaa gggagaggaa gttttatatg tttctggaag 180
 tgattgtaat ggaacccta tttctatcag agctaaaaaa gaaaataagt ctgtgaaaga 240
 aattgctgat ttttatcata aggaatttaa tcca 274

<210> 54
 <211> 91
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 54
 Cys Tyr Asn Lys Asn Lys Glu Phe Lys Glu Lys Tyr Asn Met Ser Ile
 1 5 10 15
 Phe Ile Gly Gly Ala Trp Pro Tyr Ala Asn Gly Ser Leu His Ile Gly
 20 25 30
 His Ala Ala Ala Leu Leu Pro Gly Asp Ile Leu Ala Arg Tyr Tyr Arg
 35 40 45
 Gln Lys Gly Glu Glu Val Leu Tyr Val Ser Gly Ser Asp Cys Asn Gly
 50 55 60
 Thr Pro Ile Ser Ile Arg Ala Lys Lys Glu Asn Lys Ser Val Lys Glu
 65 70 75 80
 Ile Ala Asp Phe Tyr His Lys Glu Phe Asn Pro
 85 90

<210> 55

<211> 1065
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 55
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 gaagcgcttg tccgtgctta tcttcgtgaa aagttgacac cgcattgtgga tgaagtgggtg 120
 acagatggct tgggtgggtat ttttgggtatc aaacattcag aagctgtgga tgcaccgcgc 180
 gtcttggtcg cttctcatat ggacgaagtt ggttttatgg tcagcgaaat caagccagat 240
 ggtaccttcc gtgtcgtaga aatcgggtggc tgggaaccca tgggtgggttag cagccaacgt 300
 ttcaaactct tgactcgtga tggtcattgaa attcctgtga tttcagggttc tgttcctccg 360
 catttgactc gtggaaaggg gggaccaacc atgccagcca ttgccgatat cgtttttgat 420
 ggtgggttttg cggacaaggc tgaggcagaa agttttggca tccgtccttg tgataccatt 480
 gtaccagata gttctgcaat tttgacagcc aatgaaaaaa atatcatctc aaaagcttg 540
 gataaccgct acggtgtcct catggtgaagc gagctagctg aagctttatc ggggtcaaaaa 600
 ctccggcaatg aactctatct gggtttctaac gtccaagaag aagttgggtc gcgtggcgct 660
 catacctcta caaccaagtt tgaccagaa gtcttcctcg cagttgattg ctcaccagca 720
 ggtgatgtct acggtgggtca aggcaagatt ggagatggaa ccttgattcg tttctatgat 780
 ccaggtcact tgcttctccc agggatgaag gatttccttt tgacaacggc tgaagaagct 840
 ggtatcaagt accaatacta ctgtgggtaaa ggcggaacag atgcagggtgc agctcatctg 900
 aaaaatgggtg gtgtcccatc aacaactatc ggtgtctgcg ctcggttatat ccattctcac 960
 caaacctctc atgcaatgga tgacttccta gaagcgcaag ctttcttaca agccttggtg 1020
 aagaaattgg atcgttcaac ggttgatttg attaaacatt attaa 1065

<210> 56
 <211> 354
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 56
 Met Thr Thr Leu Phe Ser Lys Ile Lys Glu Val Thr Glu Leu Ala Ala
 1 5 10 15
 Val Ser Gly His Glu Ala Pro Val Arg Ala Tyr Leu Arg Glu Lys Leu
 20 25 30
 Thr Pro His Val Asp Glu Val Val Thr Asp Gly Leu Gly Gly Ile Phe
 35 40 45
 Gly Ile Lys His Ser Glu Ala Val Asp Ala Pro Arg Val Leu Val Ala
 50 55 60
 Ser His Met Asp Glu Val Gly Phe Met Val Ser Glu Ile Lys Pro Asp
 65 70 75 80
 Gly Thr Phe Arg Val Val Glu Ile Gly Gly Trp Asn Pro Met Val Val
 85 90 95
 Ser Ser Gln Arg Phe Lys Leu Leu Thr Arg Asp Gly His Glu Ile Pro
 100 105 110
 Val Ile Ser Gly Ser Val Pro Pro His Leu Thr Arg Gly Lys Gly Gly
 115 120 125
 Pro Thr Met Pro Ala Ile Ala Asp Ile Val Phe Asp Gly Gly Phe Ala
 130 135 140

Asp Lys Ala Glu Ala Glu Ser Phe Gly Ile Arg Pro Gly Asp Thr Ile
 145 150 155 160
 Val Pro Asp Ser Ser Ala Ile Leu Thr Ala Asn Glu Lys Asn Ile Ile
 165 170 175
 Ser Lys Ala Trp Asp Asn Arg Tyr Gly Val Leu Met Val Ser Glu Leu
 180 185 190
 Ala Glu Ala Leu Ser Gly Gln Lys Leu Gly Asn Glu Leu Tyr Leu Gly
 195 200 205
 Ser Asn Val Gln Glu Glu Val Gly Leu Arg Gly Ala His Thr Ser Thr
 210 215 220
 Thr Lys Phe Asp Pro Glu Val Phe Leu Ala Val Asp Cys Ser Pro Ala
 225 230 235 240
 Gly Asp Val Tyr Gly Gly Gln Gly Lys Ile Gly Asp Gly Thr Leu Ile
 245 250 255
 Arg Phe Tyr Asp Pro Gly His Leu Leu Leu Pro Gly Met Lys Asp Phe
 260 265 270
 Leu Leu Thr Thr Ala Glu Glu Ala Gly Ile Lys Tyr Gln Tyr Tyr Cys
 275 280 285
 Gly Lys Gly Gly Thr Asp Ala Gly Ala Ala His Leu Lys Asn Gly Gly
 290 295 300
 Val Pro Ser Thr Thr Ile Gly Val Cys Ala Arg Tyr Ile His Ser His
 305 310 315 320
 Gln Thr Leu Tyr Ala Met Asp Asp Phe Leu Glu Ala Gln Ala Phe Leu
 325 330 335
 Gln Ala Leu Val Lys Lys Leu Asp Arg Ser Thr Val Asp Leu Ile Lys
 340 345 350
 His Tyr

<210> 57
 <211> 1182
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 57
 atggaatttt ctatgaaatc agtcaaagga ctactcttta tcatagctag ttttatcttg 60
 actcttttga cttggatgaa cacttctccc caattcatga ttccaggact agctttaaca 120
 agcctatctc tgacttttat cctagccact cgtctccac tactagaaag ctggtttcac 180
 agtttgaga aggtctacac cgtccacaaa ttcacagcct ttctctcaat catcctacta 240
 atctttcata acttttagtat gggcggtttg tggggctctc gcttagctgc tcagtttggc 300
 aatcttgcca tctatatctt tgccagcatc atccttgctg cctatttagg caaatacatc 360

```

caatacgaag cttggcgatg gattcaccgc ctggtttacc tagcctatat tttaggactc 420
tttcacatct acatgataat gggcaatcgt ctccttacat ttaatcttct aagttttctt 480
gttggttagct atgccctttt aggcttacta gctggttttt atatcatttt tctatatcaa 540
aagatttcct tcccctatct agggaaaaatt acccatctca aacgcttaaa tcacgatact 600
agagaaattc aaatccatct tagcagacct ttcaactatc aatcaggaca atttgccttt 660
ctaaagattt tccaagaagg ctttgaaagt gctccgcac ccttttctat ctcaggagggt 720
catggtcaaa ctctttactt tactgttaaa acttcaggcg accataccaa gaatatctat 780
gataatcttc aagccggcag caaagtaacc ctagacagag cttacggaca catgatcata 840
gaagaaggac gagaaaatca ggtttgatt gctggaggta ttgggatcac ccccttcac 900
tcttacatcc gtgaacatcc tatttttagat aaacagggtc acttctacta tagcttccgt 960
ggagatgaaa atgcagtcta cctagattta ctccgtaact atgctcagaa aaatccta 1020
tttgaactcc atctaactga cagtacgaaa gacggctatc ttaattttga acaaaaagaa 1080
gtgcccgaac atgcaaccgt ctatatgtgt ggtcctatct ctatgatgaa ggcacttgcc 1140
aaacagatta agaacaacaa tccaaaaaca gagcatatct ac 1182

```

<210> 58

<211> 394

<212> PRT

<213> Streptococcus pneumoniae

<400> 58

```

Met Glu Phe Ser Met Lys Ser Val Lys Gly Leu Leu Phe Ile Ile Ala
  1              5              10              15

```

```

Ser Phe Ile Leu Thr Leu Leu Thr Trp Met Asn Thr Ser Pro Gln Phe
          20              25              30

```

```

Met Ile Pro Gly Leu Ala Leu Thr Ser Leu Ser Leu Thr Phe Ile Leu
          35              40              45

```

```

Ala Thr Arg Leu Pro Leu Leu Glu Ser Trp Phe His Ser Leu Glu Lys
          50              55              60

```

```

Val Tyr Thr Val His Lys Phe Thr Ala Phe Leu Ser Ile Ile Leu Leu
          65              70              75              80

```

```

Ile Phe His Asn Phe Ser Met Gly Gly Leu Trp Gly Ser Arg Leu Ala
          85              90              95

```

```

Ala Gln Phe Gly Asn Leu Ala Ile Tyr Ile Phe Ala Ser Ile Ile Leu
          100             105             110

```

```

Val Ala Tyr Leu Gly Lys Tyr Ile Gln Tyr Glu Ala Trp Arg Trp Ile
          115             120             125

```

```

His Arg Leu Val Tyr Leu Ala Tyr Ile Leu Gly Leu Phe His Ile Tyr
          130             135             140

```

```

Met Ile Met Gly Asn Arg Leu Leu Thr Phe Asn Leu Leu Ser Phe Leu
          145             150             155             160

```

```

Val Gly Ser Tyr Ala Leu Leu Gly Leu Leu Ala Gly Phe Tyr Ile Ile
          165             170             175

```

```

Phe Leu Tyr Gln Lys Ile Ser Phe Pro Tyr Leu Gly Lys Ile Thr His
          180             185             190

```

Leu Lys Arg Leu Asn His Asp Thr Arg Glu Ile Gln Ile His Leu Ser
 195 200 205
 Arg Pro Phe Asn Tyr Gln Ser Gly Gln Phe Ala Phe Leu Lys Ile Phe
 210 215 220
 Gln Glu Gly Phe Glu Ser Ala Pro His Pro Phe Ser Ile Ser Gly Gly
 225 230 235 240
 His Gly Gln Thr Leu Tyr Phe Thr Val Lys Thr Ser Gly Asp His Thr
 245 250 255
 Lys Asn Ile Tyr Asp Asn Leu Gln Ala Gly Ser Lys Val Thr Leu Asp
 260 265 270
 Arg Ala Tyr Gly His Met Ile Ile Glu Glu Gly Arg Glu Asn Gln Val
 275 280 285
 Trp Ile Ala Gly Gly Ile Gly Ile Thr Pro Phe Ile Ser Tyr Ile Arg
 290 295 300
 Glu His Pro Ile Leu Asp Lys Gln Val His Phe Tyr Tyr Ser Phe Arg
 305 310 315 320
 Gly Asp Glu Asn Ala Val Tyr Leu Asp Leu Leu Arg Asn Tyr Ala Gln
 325 330 335
 Lys Asn Pro Asn Phe Glu Leu His Leu Ile Asp Ser Thr Lys Asp Gly
 340 345 350
 Tyr Leu Asn Phe Glu Gln Lys Glu Val Pro Glu His Ala Thr Val Tyr
 355 360 365
 Met Cys Gly Pro Ile Ser Met Met Lys Ala Leu Ala Lys Gln Ile Lys
 370 375 380
 Lys Gln Asn Pro Lys Thr Glu His Ile Tyr
 385 390

<210> 59

<211> 900

<212> DNA

<213> Streptococcus pneumoniae

<400> 59

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 tttttaaatc acgttatggg gcaaaagatt gccatcatga gtgacaaggc gcagacaacg 120
 cgcaataaaa tcatgggaat ttacacgact gataaggagc aaattgtctt tatcgacaca 180
 ccagggatc acaagcctaa aacagctctc ggagatttca tggttgagtc tgcctacagt 240
 acccttcgcg aagtggacac tgttcttttc atgggtgcctg ctgatgaagc gcgtggtaag 300
 ggggacgata tgattatcga gcgtctcaag gctgccaagg ttcctgtgat tttggtggtg 360
 aataaaatcg ataagggtcca tccagaccag ctcttgtctc agattgatga cttccgtaat 420
 caaatggact ttaaggaaat tgttccaatc tcagcccttc agggaaataa cgtgtctcgt 480
 ctagtggata ttttgagtga aaatctggat gaagggtttcc aatatttccc gtctgatcaa 540

| | | | | | | |
|------------|------------|------------|------------|------------|-------------|-----|
| atcacagacc | atccagaacg | tttcttggtt | tcagaaatgg | ttcgcgagaa | agtcttgcac | 600 |
| ctaactcgtg | aagagattcc | gcattctgta | gcagtagttg | ttgactctat | gaaacgagac | 660 |
| gaagagacag | acaaggttca | catccgtgca | accatcatgg | tcgagcgcga | tagccaaaaa | 720 |
| gggattatca | tcggtaaagg | tggcgctatg | cttaagaaaa | tcggtagcat | ggcccgtcgt | 780 |
| gatatcgaac | tcatgctagg | agacaaggtc | ttcctagaaa | cctgggtcaa | gggtcaagaaa | 840 |
| aactggcgcg | ataaaaagct | agatttggtt | gactttggct | ataatgaaag | agaataactaa | 900 |

<400> 60

Gly Lys Ser Thr Phe Leu Asn His Val Met Gly Gln Lys Ile Ala Ile
20 25 30

Thr Thr Asp Lys Glu Gln Ile Val Phe Ile Asp Thr Pro Gly Ile His
50 55 60

Thr Leu Arg Glu Val Asp Thr Val Leu Phe Met Val Pro Ala Asp Glu
85 90 95

Lys Val Pro Val Ile Leu Val Val Asn Lys Ile Asp Lys Val His Pro
115 120 125

Lys Glu Ile Val Pro Ile Ser Ala Leu Gln Gly Asn Asn Val Ser Arg
145 150 155 160

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Pro | Ser | Asp | Gln | Ile | Thr | Asp | His | Pro | Glu | Arg | Phe | Leu | Val | Ser | Glu |
| | | | 180 | | | | | 185 | | | | | 190 | | |

Ser Val Ala Val Val Val Asp Ser Met Lys Arg Asp Glu Glu Thr Asp
210 215 220

| | | | |
|-----------------|-----------------|---------------------|-----------------|
| 225 | 230 | 235 | 240 |
| Gly Ile Ile Ile | Gly Lys Gly Gly | Ala Met Leu Lys Lys | Ile Gly Ser |
| | 245 | 250 | 255 |
| Met Ala Arg Arg | Asp Ile Glu Leu | Met Leu Gly Asp | Lys Val Phe Leu |
| | 260 | 265 | 270 |
| Glu Thr Trp Val | Lys Val Lys Lys | Asn Trp Arg Asp | Lys Lys Leu Asp |
| | 275 | 280 | 285 |
| Leu Ala Asp Phe | Gly Tyr Asn Glu | Arg Glu Tyr | |
| | 290 | 295 | |

<210> 61
 <211> 855
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 61
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 tgtcgtggct tagaaaaatt gattatagga aagaagattt cgagtataga aattcgctac 120
 cccaagatga ttaagacgga tttggaagag tttcaaaggg aattgcctag tcagattatc 180
 gagtcaatgg gacgtcgtgg aaaatatttg cttttttatc tgacagacaa ggtcttgatt 240
 tcccatttgc ggatggaggg caagtatttt tactatccag accaaggacc tgaacgcaag 300
 catgcccattg ttttctttca ttttgaagat ggtggcacgc ttgtttatga ggatgttcgc 360
 aagtttgga ccatggaact cttggtgcct gaccttttag acgtctactt tatttctaaa 420
 aaattaggtc ctgaaccaag cgaacaagac tttgatttac aggtctttca atctgccctt 480
 gccaaagtcca aaaagcctat caaatcccat ctctagacc agaccttggg agctggactt 540
 ggcaatatct atgtggatga ggttctcttg cgagctcagg ttcattccagc tagaccttcc 600
 cagactttga cagcagaaga agcgactgcc attcatgacc agaccattgc tgttttgggc 660
 caggctgttg aaaaagggtg ctcaccatt cggacttata ccaatgcctt tggggaagat 720
 ggaagcatgc aggactttca tcaggtctat gataagactg gtcaagaatg tgtacgctgt 780
 ggtaccatca ttgagaaaat tcaactaggc ggacgtggaa cccacttttg tccaaactgt 840
 caaaggaggg actga 855

<210> 62
 <211> 284
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 62
 Met Leu Leu Val Phe Thr Glu Gly Gly Leu Met Pro Glu Leu Pro Glu
 1 5 10 15
 Val Glu Thr Val Cys Arg Gly Leu Glu Lys Leu Ile Ile Gly Lys Lys
 20 25 30
 Ile Ser Ser Ile Glu Ile Arg Tyr Pro Lys Met Ile Lys Thr Asp Leu
 35 40 45
 Glu Glu Phe Gln Arg Glu Leu Pro Ser Gln Ile Ile Glu Ser Met Gly
 50 55 60

Arg Arg Gly Lys Tyr Leu Leu Phe Tyr Leu Thr Asp Lys Val Leu Ile
 65 70 75 80
 Ser His Leu Arg Met Glu Gly Lys Tyr Phe Tyr Tyr Pro Asp Gln Gly
 85 90 95
 Pro Glu Arg Lys His Ala His Val Phe Phe His Phe Glu Asp Gly Gly
 100 105 110
 Thr Leu Val Tyr Glu Asp Val Arg Lys Phe Gly Thr Met Glu Leu Leu
 115 120 125
 Val Pro Asp Leu Leu Asp Val Tyr Phe Ile Ser Lys Lys Leu Gly Pro
 130 135 140
 Glu Pro Ser Glu Gln Asp Phe Asp Leu Gln Val Phe Gln Ser Ala Leu
 145 150 155 160
 Ala Lys Ser Lys Lys Pro Ile Lys Ser His Leu Leu Asp Gln Thr Leu
 165 170 175
 Val Ala Gly Leu Gly Asn Ile Tyr Val Asp Glu Val Leu Trp Arg Ala
 180 185 190
 Gln Val His Pro Ala Arg Pro Ser Gln Thr Leu Thr Ala Glu Glu Ala
 195 200 205
 Thr Ala Ile His Asp Gln Thr Ile Ala Val Leu Gly Gln Ala Val Glu
 210 215 220
 Lys Gly Gly Ser Thr Ile Arg Thr Tyr Thr Asn Ala Phe Gly Glu Asp
 225 230 235 240
 Gly Ser Met Gln Asp Phe His Gln Val Tyr Asp Lys Thr Gly Gln Glu
 245 250 255
 Cys Val Arg Cys Gly Thr Ile Ile Glu Lys Ile Gln Leu Gly Gly Arg
 260 265 270
 Gly Thr His Phe Cys Pro Asn Cys Gln Arg Arg Asp
 275 280

<210> 63

<211> 633

<212> DNA

<213> Streptococcus pneumoniae

<400> 63

ttgtccaaac tgtcaaagga gggactgatg ggaaaaatca tcggaatcac tgggggaatt 60
 gcctctggta agtcaactgt gacaaatatt ctaagacagc aaggctttca agtagtggat 120
 gccgacgcag tcgtccacca actacagaaa cctggttggtc gtctggttga ggctctagta 180
 cagcactttg ggcaagaaat cattcttgaa aacggagAAC tcaatcgccc tctcctagct 240
 agtctcatct tttcaaattcc tgatgaacga gaatggtcta agcaaattca aggggagatt 300
 atccgtgagg aactggctac tttgagagaa cagttggctc agacagaaga gattttcttc 360
 atggatattc ccctactttt tgagcaggac tacagcgatt ggtttgctga gacttggttg 420

gtctatgtgg accgagatgc ccaagtggaa cgcttaatga aaagggacca gttgtccaaa 480
 gatgaagctg agtctcgtct ggcagcccag tggccttttag aaaaaaagaa agatttgccc 540
 agccagggtc ttgataataa tggcaatcag aaccagcttc ttaatcaagt gcatacctt 600
 cttgaggagg gtaggcaaga tgacagagat taa 633

<210> 64

<211> 210

<212> PRT

<213> Streptococcus pneumoniae

<400> 64

| | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ser | Lys | Leu | Ser | Lys | Glu | Gly | Leu | Met | Gly | Lys | Ile | Ile | Gly | Ile | 1 | 5 | 10 | 15 |
| Thr | Gly | Gly | Ile | Ala | Ser | Gly | Lys | Ser | Thr | Val | Thr | Asn | Phe | Leu | Arg | 20 | 25 | 30 | |
| Gln | Gln | Gly | Phe | Gln | Val | Val | Asp | Ala | Asp | Ala | Val | Val | His | Gln | Leu | 35 | 40 | 45 | |
| Gln | Lys | Pro | Gly | Gly | Arg | Leu | Phe | Glu | Ala | Leu | Val | Gln | His | Phe | Gly | 50 | 55 | 60 | |
| Gln | Glu | Ile | Ile | Leu | Glu | Asn | Gly | Glu | Leu | Asn | Arg | Pro | Leu | Leu | Ala | 65 | 70 | 75 | 80 |
| Ser | Leu | Ile | Phe | Ser | Asn | Pro | Asp | Glu | Arg | Glu | Trp | Ser | Lys | Gln | Ile | 85 | 90 | 95 | |
| Gln | Gly | Glu | Ile | Ile | Arg | Glu | Glu | Leu | Ala | Thr | Leu | Arg | Glu | Gln | Leu | 100 | 105 | 110 | |
| Ala | Gln | Thr | Glu | Glu | Ile | Phe | Phe | Met | Asp | Ile | Pro | Leu | Leu | Phe | Glu | 115 | 120 | 125 | |
| Gln | Asp | Tyr | Ser | Asp | Trp | Phe | Ala | Glu | Thr | Trp | Leu | Val | Tyr | Val | Asp | 130 | 135 | 140 | |
| Arg | Asp | Ala | Gln | Val | Glu | Arg | Leu | Met | Lys | Arg | Asp | Gln | Leu | Ser | Lys | 145 | 150 | 155 | 160 |
| Asp | Glu | Ala | Glu | Ser | Arg | Leu | Ala | Ala | Gln | Trp | Pro | Leu | Glu | Lys | Lys | 165 | 170 | 175 | |
| Lys | Asp | Leu | Ala | Ser | Gln | Val | Leu | Asp | Asn | Asn | Gly | Asn | Gln | Asn | Gln | 180 | 185 | 190 | |
| Leu | Leu | Asn | Gln | Val | His | Ile | Leu | Leu | Glu | Gly | Gly | Arg | Gln | Asp | Asp | 195 | 200 | 205 | |
| Arg | Asp | | | | | | | | | | | | | | | 210 | | | |

<210> 65

<211> 1269
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 65
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 gtaggcaaga tgacagagat taactggaag gataatctgc gcattgcctg gtttggtaat 120
 tttctgacag gagccagtat ttcttttggt gtacctttta tgcccatctt cgtggaaaaat 180
 ctagggtgtag ggagtcagca agtcgccttt tatgcaggct tagcaatttc tgtctctgct 240
 atttccgcgg cgctcttttc tcctatttgg ggtattcttg ctgacaaaata cggccgaaaa 300
 cccatgatga ttcgggcagg tcttgctatg actatcacta tgggaggctt ggcccttgtc 360
 ccaaatatct attggttaat ctttcttcgt ttactaaacg gtgtatttgc aggttttgtt 420
 cctaatacaa cggcactgat agccagtcag gttccaaagg agaaatcagg ctctgcctta 480
 ggtactttgt ctacaggcgt agttgcagg actctaactg gtccctttat tgggtggcttt 540
 atcgagaat tatttggcat tcgtacagtt ttcttactgg ttggtagttt tctattttta 600
 gctgctattt tgactatttg ctttatcaag gaagatttcc aaccagtagc caaggaaaag 660
 gctattccaa caaaggaatt atttacctcg gttaaatata cctatctttt gctcaatctc 720
 tttttaacca gttttgtcat ccaattttca gctcaatcga ttggccctat tttggctctt 780
 tatgtacgag acttagggca gacagagaat cttctttttg tctctggttt gattgtgtcc 840
 agtatgggct tttccagcat gatgagtgc ggagtcagtg gcaagctagg tgacaagggtg 900
 ggcaatcatc gtctcttggt tgtcgcccag ttttattcag tcatcatcta tctcctctgt 960
 gccaatgcct ctagccccct tcaactagga ctctatcgtt tctcttttgg attgggaacc 1020
 ggtgccttga ttcccggggt taatgcccta ctacagcaaaa tgactcccaa agccggcatt 1080
 tcgaggggtc ttgccttcaa tcaggtattc ttttatctgg gaggtgtgtg tgggtcccatg 1140
 gcaggttctg cagtagcagg tcaatttggc taccatgctg tcttttatgc gacaagcctt 1200
 tgtgttgctt ttagttgtct ctttaacctg attcaatttc gaacattatt aaaagtaaag 1260
 gaaatctag 1269

<210> 66
 <211> 422
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 66
 Met Ile Ile Met Ala Ile Arg Thr Ser Phe Leu Ile Lys Cys Ile Ser
 1 5 10 15
 Phe Leu Arg Glu Val Gly Lys Met Thr Glu Ile Asn Trp Lys Asp Asn
 20 25 30
 Leu Arg Ile Ala Trp Phe Gly Asn Phe Leu Thr Gly Ala Ser Ile Ser
 35 40 45
 Leu Val Val Pro Phe Met Pro Ile Phe Val Glu Asn Leu Gly Val Gly
 50 55 60
 Ser Gln Gln Val Ala Phe Tyr Ala Gly Leu Ala Ile Ser Val Ser Ala
 65 70 75 80
 Ile Ser Ala Ala Leu Phe Ser Pro Ile Trp Gly Ile Leu Ala Asp Lys
 85 90 95
 Tyr Gly Arg Lys Pro Met Met Ile Arg Ala Gly Leu Ala Met Thr Ile
 100 105 110
 Thr Met Gly Gly Leu Ala Phe Val Pro Asn Ile Tyr Trp Leu Ile Phe

| | | |
|---|-----|-----|
| 115 | 120 | 125 |
| Leu Arg Leu Leu Asn Gly Val Phe Ala Gly Phe Val Pro Asn Ala Thr | | |
| 130 | 135 | 140 |
| Ala Leu Ile Ala Ser Gln Val Pro Lys Glu Lys Ser Gly Ser Ala Leu | | |
| 145 | 150 | 155 |
| Gly Thr Leu Ser Thr Gly Val Val Ala Gly Thr Leu Thr Gly Pro Phe | | |
| | 165 | 170 |
| Ile Gly Gly Phe Ile Ala Glu Leu Phe Gly Ile Arg Thr Val Phe Leu | | |
| | 180 | 185 |
| Leu Val Gly Ser Phe Leu Phe Leu Ala Ala Ile Leu Thr Ile Cys Phe | | |
| | 195 | 200 |
| Ile Lys Glu Asp Phe Gln Pro Val Ala Lys Glu Lys Ala Ile Pro Thr | | |
| | 210 | 215 |
| Lys Glu Leu Phe Thr Ser Val Lys Tyr Pro Tyr Leu Leu Leu Asn Leu | | |
| | 225 | 230 |
| Phe Leu Thr Ser Phe Val Ile Gln Phe Ser Ala Gln Ser Ile Gly Pro | | |
| | 245 | 250 |
| Ile Leu Ala Leu Tyr Val Arg Asp Leu Gly Gln Thr Glu Asn Leu Leu | | |
| | 260 | 265 |
| Phe Val Ser Gly Leu Ile Val Ser Ser Met Gly Phe Ser Ser Met Met | | |
| | 275 | 280 |
| Ser Ala Gly Val Met Gly Lys Leu Gly Asp Lys Val Gly Asn His Arg | | |
| | 290 | 295 |
| Leu Leu Val Val Ala Gln Phe Tyr Ser Val Ile Ile Tyr Leu Leu Cys | | |
| | 305 | 310 |
| Ala Asn Ala Ser Ser Pro Leu Gln Leu Gly Leu Tyr Arg Phe Leu Phe | | |
| | 325 | 330 |
| Gly Leu Gly Thr Gly Ala Leu Ile Pro Gly Val Asn Ala Leu Leu Ser | | |
| | 340 | 345 |
| Lys Met Thr Pro Lys Ala Gly Ile Ser Arg Val Phe Ala Phe Asn Gln | | |
| | 355 | 360 |
| Val Phe Phe Tyr Leu Gly Gly Val Val Gly Pro Met Ala Gly Ser Ala | | |
| | 370 | 375 |
| Val Ala Gly Gln Phe Gly Tyr His Ala Val Phe Tyr Ala Thr Ser Leu | | |
| | 385 | 390 |
| Cys Val Ala Phe Ser Cys Leu Phe Asn Leu Ile Gln Phe Arg Thr Leu | | |
| | 405 | 410 |
| Leu Lys Val Lys Glu Ile | | |

<210> 67
 <211> 1311
 <212> DNA
 <213> *Streptococcus pneumoniae*

<400> 67
 atggccctac caactattgc cattgtagga cgtcccaatg ttgggaaatc aaccctatatt 60
 aatcggatcg ctggtgagcg aatctccatt gtagaagatg tcgaaggagt gacacgtgac 120
 cgtatttatg caacgggtga gtggctcaat cgttctttta gcatgattga tacaggagga 180
 attgatgatg tcgatgctcc ttcatggaa caaatcaagc accaggcaga aattgccatg 240
 gaagaagcag atgttatcgt ttttgcgtg tctggttaagg aaggaattac tgatgcagac 300
 gaatacgtag ctcgtaagct ttataagacc cacaaaccag ttatcctcgc agtcaacaag 360
 gtggacaacc ctgagatgag aaatgatata tatgatttct atgctctcgc tttgggtgaa 420
 ccattgccta tctcatctgt ccattggaatc ggtacagggg atgtgctaga tgcgatcgta 480
 gaaaatcttc caaatgaata tgaggaagaa aatccagatg tcattaagtt tagcttgatt 540
 ggtcgtccta acgttggaat atcaagcttg atcaatgcta tcttgggaga agaccgtgtt 600
 attgctagtc ctgttgctgg aacaactcgt gatgccattg ataccactt tacagataca 660
 gatggtcaag agtttaccat gattgatacg gctggtatgc gtaagtctgg taaggtttat 720
 gaaaatactg agaaatactc tgttatgcgt gccatgctg ctattgaccg ttcagatgtg 780
 gtcttgatgg tcatcaatgc ggaagaaggc attcgtgagt acgacaagcg tatcgcagga 840
 tttgcccattg aagctggtaa agggatgatt atcgtggtca acaagtggga tacgcttgaa 900
 aaagataacc acactatgaa aaactgggaa gaagatatcc gtgagcagtt ccaatacctg 960
 ccttacgcac cgattatctt tgtatcagct ttaaccaagc aacgtctcca caaacttctt 1020
 gagatgatta agcaaactcag cgaaagtcaa aatacacgta ttccatcagc tgtcttgaac 1080
 gatgtcatca tggatgccat tgccatcaac ccaacaccga cagacaaagg aaaacgtctc 1140
 aagattttct atgcgaccca agtggcaacc aaaccaccaa cttttgtcat ctttgtcaat 1200
 gaagaagaac tcatgcactt ttcttacctg cgtttcttgg aaaatcaaat ccgcaaggcc 1260
 tttgtttttg agggaaacacc gattcatctc atcgcaagaa aacgcaaata a 1311

<210> 68
 <211> 436
 <212> PRT
 <213> *Streptococcus pneumoniae*

<400> 68
 Met Ala Leu Pro Thr Ile Ala Ile Val Gly Arg Pro Asn Val Gly Lys
 1 5 10 15
 Ser Thr Leu Phe Asn Arg Ile Ala Gly Glu Arg Ile Ser Ile Val Glu
 20 25 30
 Asp Val Glu Gly Val Thr Arg Asp Arg Ile Tyr Ala Thr Gly Glu Trp
 35 40 45
 Leu Asn Arg Ser Phe Ser Met Ile Asp Thr Gly Gly Ile Asp Asp Val
 50 55 60
 Asp Ala Pro Phe Met Glu Gln Ile Lys His Gln Ala Glu Ile Ala Met
 65 70 75 80
 Glu Glu Ala Asp Val Ile Val Phe Val Val Ser Gly Lys Glu Gly Ile
 85 90 95

Thr Asp Ala Asp Glu Tyr Val Ala Arg Lys Leu Tyr Lys Thr His Lys
 100 105 110
 Pro Val Ile Leu Ala Val Asn Lys Val Asp Asn Pro Glu Met Arg Asn
 115 120 125
 Asp Ile Tyr Asp Phe Tyr Ala Leu Gly Leu Gly Glu Pro Leu Pro Ile
 130 135 140
 Ser Ser Val His Gly Ile Gly Thr Gly Asp Val Leu Asp Ala Ile Val
 145 150 155 160
 Glu Asn Leu Pro Asn Glu Tyr Glu Glu Glu Asn Pro Asp Val Ile Lys
 165 170 175
 Phe Ser Leu Ile Gly Arg Pro Asn Val Gly Lys Ser Ser Leu Ile Asn
 180 185 190
 Ala Ile Leu Gly Glu Asp Arg Val Ile Ala Ser Pro Val Ala Gly Thr
 195 200 205
 Thr Arg Asp Ala Ile Asp Thr His Phe Thr Asp Thr Asp Gly Gln Glu
 210 215 220
 Phe Thr Met Ile Asp Thr Ala Gly Met Arg Lys Ser Gly Lys Val Tyr
 225 230 235 240
 Glu Asn Thr Glu Lys Tyr Ser Val Met Arg Ala Met Arg Ala Ile Asp
 245 250 255
 Arg Ser Asp Val Val Leu Met Val Ile Asn Ala Glu Glu Gly Ile Arg
 260 265 270
 Glu Tyr Asp Lys Arg Ile Ala Gly Phe Ala His Glu Ala Gly Lys Gly
 275 280 285
 Met Ile Ile Val Val Asn Lys Trp Asp Thr Leu Glu Lys Asp Asn His
 290 295 300
 Thr Met Lys Asn Trp Glu Glu Asp Ile Arg Glu Gln Phe Gln Tyr Leu
 305 310 315 320
 Pro Tyr Ala Pro Ile Ile Phe Val Ser Ala Leu Thr Lys Gln Arg Leu
 325 330 335
 His Lys Leu Pro Glu Met Ile Lys Gln Ile Ser Glu Ser Gln Asn Thr
 340 345 350
 Arg Ile Pro Ser Ala Val Leu Asn Asp Val Ile Met Asp Ala Ile Ala
 355 360 365
 Ile Asn Pro Thr Pro Thr Asp Lys Gly Lys Arg Leu Lys Ile Phe Tyr
 370 375 380
 Ala Thr Gln Val Ala Thr Lys Pro Pro Thr Phe Val Ile Phe Val Asn
 385 390 395 400

Glu Glu Glu Leu Met His Phe Ser Tyr Leu Arg Phe Leu Glu Asn Gln
405 410 415

Ile Arg Lys Ala Phe Val Phe Glu Gly Thr Pro Ile His Leu Ile Ala
420 425 430

Arg Lys Arg Lys
435

<210> 69
<211> 714
<212> DNA
<213> Streptococcus pneumoniae

<400> 69
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aagaatttcc aatcctactc tgtgattgtg gtacgaagtc aagagaagaa agatgccttg 180
tatgaattgg tacctcaaga agccattcgc cagtctgctg ttttccttct ctttgtcggg 240
gatttgaacc gagcagaaaa gggagcccga cttcataccg acaccttcca accccaaggt 300
gtggaaggtc tcttgattag ttcggtcgat gcagctcttg ctggacaaaa cgccttggtg 360
gcagctgaaa gcttgggcta tgggtggtgtg attatcggtt tggttcgata caagtctgaa 420
gaagtggcag agctctttaa cctacctgac tacacctatt ctgtccttgg gatggcactg 480
ggtgtgccaa atcaacatca tgatatgaaa ccgagactgc cactagagaa tgttgtcttt 540
gaggaagaat accaagaaca gtcaactgag gcaatccaag cttatgaccg tgttcaggct 600
gactatgctg gggcgctgc gaccacaagc tggagtcagc gcctagcaga acagtttggg 660
caagctgaac caagctcaac tagaaaaaat cttgaacaga agaaattatt gtag 714

<210> 70
<211> 237
<212> PRT
<213> Streptococcus pneumoniae

<400> 70
Met Thr Glu Thr Ile Lys Leu Met Lys Ala His Thr Ser Val Arg Arg
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Phe Lys Glu Gln Glu Ile Pro Gln Val Asp Leu Asn Glu Ile Leu Thr
20 25 30

Ala Ala Gln Met Ala Ser Ser Trp Lys Asn Phe Gln Ser Tyr Ser Val
35 40 45

Ile Val Val Arg Ser Gln Glu Lys Lys Asp Ala Leu Tyr Glu Leu Val
50 55 60

Pro Gln Glu Ala Ile Arg Gln Ser Ala Val Phe Leu Leu Phe Val Gly
65 70 75 80

Asp Leu Asn Arg Ala Glu Lys Gly Ala Arg Leu His Thr Asp Thr Phe
85 90 95

Gln Pro Gln Gly Val Glu Gly Leu Leu Ile Ser Ser Val Asp Ala Ala

100 105 110
 Leu Ala Gly Gln Asn Ala Leu Leu Ala Ala Glu Ser Leu Gly Tyr Gly
 115 120 125
 Gly Val Ile Ile Gly Leu Val Arg Tyr Lys Ser Glu Glu Val Ala Glu
 130 135 140
 Leu Phe Asn Leu Pro Asp Tyr Thr Tyr Ser Val Phe Gly Met Ala Leu
 145 150 155 160
 Gly Val Pro Asn Gln His His Asp Met Lys Pro Arg Leu Pro Leu Glu
 165 170 175
 Asn Val Val Phe Glu Glu Glu Tyr Gln Glu Gln Ser Thr Glu Ala Ile
 180 185 190
 Gln Ala Tyr Asp Arg Val Gln Ala Asp Tyr Ala Gly Ala Arg Ala Thr
 195 200 205
 Thr Ser Trp Ser Gln Arg Leu Ala Glu Gln Phe Gly Gln Ala Glu Pro
 210 215 220
 Ser Ser Thr Arg Lys Asn Leu Glu Gln Lys Lys Leu Leu
 225 230 235

<210> 71
 <211> 729
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 71
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 ggaaagacca ccctcttttaa tctaatacgt gggatttttag aagttcagtc agggagaatt 180
 gtccttgatg gtgaagaaaa tcccaagggg cgcgtgagtt atatgttgca aaaggatctg 240
 ctcttgagc acaagacggt gcttggaat atcattctgc ccctcttgat tcaaaagggtg 300
 gataaggcag aagctatttc ccgagcggat aaaattcttg cgaccttcca gctgacagct 360
 gtaagagaca agtatacctca tgaacttagc ggtgggatgc gccagcgtgt agccttactc 420
 cggacctacc tttttgggca caagctcttt ctcttagatg aggcttttag cgccttgat 480
 gagatgacaa agatggaact ccacgcttggt tatcttgaga ttcacaagca gttgcagcta 540
 acaaccctga tcatcacgca tagtattgag gaggcctca atctcagcga ccgtatctat 600
 atcttgaaaa atcgccctgg gcagattggt tcagaaatta aactagattg gtctgaagat 660
 gaggacaagg aagtccaaaa gattgcctac aaacgtcaaa ttttggcgga attaggctta 720
 gataagtag 729

<210> 72
 <211> 242
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 72
 Met Thr Glu Ile Arg Leu Glu His Val Ser Tyr Ala Tyr Gly Gln Glu
 1 5 10 15

Arg Ile Leu Glu Asp Ile Asn Leu Gln Val Thr Ser Gly Glu Val Val
 20 25 30
 Ser Ile Leu Gly Pro Ser Gly Val Gly Lys Thr Thr Leu Phe Asn Leu
 35 40 45
 Ile Ala Gly Ile Leu Glu Val Gln Ser Gly Arg Ile Val Leu Asp Gly
 50 55 60
 Glu Glu Asn Pro Lys Gly Arg Val Ser Tyr Met Leu Gln Lys Asp Leu
 65 70 75 80
 Leu Leu Glu His Lys Thr Val Leu Gly Asn Ile Ile Leu Pro Leu Leu
 85 90 95
 Ile Gln Lys Val Asp Lys Ala Glu Ala Ile Ser Arg Ala Asp Lys Ile
 100 105 110
 Leu Ala Thr Phe Gln Leu Thr Ala Val Arg Asp Lys Tyr Pro His Glu
 115 120 125
 Leu Ser Gly Gly Met Arg Gln Arg Val Ala Leu Leu Arg Thr Tyr Leu
 130 135 140
 Phe Gly His Lys Leu Phe Leu Leu Asp Glu Ala Phe Ser Ala Leu Asp
 145 150 155 160
 Glu Met Thr Lys Met Glu Leu His Ala Trp Tyr Leu Glu Ile His Lys
 165 170 175
 Gln Leu Gln Leu Thr Thr Leu Ile Ile Thr His Ser Ile Glu Glu Ala
 180 185 190
 Leu Asn Leu Ser Asp Arg Ile Tyr Ile Leu Lys Asn Arg Pro Gly Gln
 195 200 205
 Ile Val Ser Glu Ile Lys Leu Asp Trp Ser Glu Asp Glu Asp Lys Glu
 210 215 220
 Val Gln Lys Ile Ala Tyr Lys Arg Gln Ile Leu Ala Glu Leu Gly Leu
 225 230 235 240
 Asp Lys

<210> 73

<211> 2433

<212> DNA

<213> Streptococcus pneumoniae

<400> 73

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 agtgtagcag gggcaacttt aaatgattat ccgtatgaga tggaccgttt agaagagggtg 180

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gctttggaac tgactgaaac ggactatagc caggatgaaa cctttacgga attgccgttc 240
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aaggtactag ggacagagca cgtcctctat gcgattttgc atgatagcaa tgccttggcg 360
actcgtatct tggagagggc tggtttttct tatgaagaca agaaagatca ggtcaagatt 420
gctgctcttc gtcgaaattt agaagaacgg gcaggctgga ctcgtgaaga tctcaaggct 480
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gaccagaga tgggagctcg ccacttctgc agaaccctgc aaacagaagt ggaggacaag 2340
ttggcagaac ttcttctcaa gggagattta gtggcaggca gcacacttaa gattggtgtc 2400
aaagcaggcc agttaaattt tgatattgca taa 2433

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<210> 74

<211> 810

<212> PRT

<213> Streptococcus pneumoniae

<400> 74

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Met Asn Tyr Ser Lys Ala Leu Asn Glu Cys Ile Glu Ser Ala Tyr Met
  1                      5                      10                      15

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Val Ala Gly His Phe Gly Ala Arg Tyr Leu Glu Ser Trp His Leu Leu
      20                      25                      30

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Ile Ala Met Ser Asn His Ser Tyr Ser Val Ala Gly Ala Thr Leu Asn
      35                      40                      45

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Asp Tyr Pro Tyr Glu Met Asp Arg Leu Glu Glu Val Ala Leu Glu Leu
      50                      55                      60

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Thr Glu Thr Asp Tyr Ser Gln Asp Glu Thr Phe Thr Glu Leu Pro Phe
 65 70 75 80
 Ser Arg Arg Leu Gln Val Leu Phe Asp Glu Ala Glu Tyr Val Ala Ser
 85 90 95
 Val Val His Ala Lys Val Leu Gly Thr Glu His Val Leu Tyr Ala Ile
 100 105 110
 Leu His Asp Ser Asn Ala Leu Ala Thr Arg Ile Leu Glu Arg Ala Gly
 115 120 125
 Phe Ser Tyr Glu Asp Lys Lys Asp Gln Val Lys Ile Ala Ala Leu Arg
 130 135 140
 Arg Asn Leu Glu Glu Arg Ala Gly Trp Thr Arg Glu Asp Leu Lys Ala
 145 150 155 160
 Leu Arg Gln Arg His Arg Thr Val Ala Asp Lys Gln Asn Ser Met Ala
 165 170 175
 Asn Met Met Gly Met Pro Gln Thr Pro Ser Gly Gly Leu Glu Asp Tyr
 180 185 190
 Thr His Asp Leu Thr Glu Gln Ala Arg Ser Gly Lys Leu Glu Pro Val
 195 200 205
 Ile Gly Arg Asp Lys Glu Ile Ser Arg Met Ile Gln Ile Leu Ser Arg
 210 215 220
 Lys Thr Lys Asn Asn Pro Val Leu Val Gly Asp Ala Gly Val Gly Lys
 225 230 235 240
 Thr Ala Leu Ala Leu Gly Leu Ala Gln Arg Ile Ala Ser Gly Asp Val
 245 250 255
 Pro Ala Glu Met Ala Lys Met Arg Val Leu Glu Leu Asp Leu Met Asn
 260 265 270
 Val Val Ala Gly Thr Arg Phe Arg Gly Asp Phe Glu Glu Arg Met Asn
 275 280 285
 Asn Ile Ile Lys Asp Ile Glu Glu Asp Gly Gln Val Ile Leu Phe Ile
 290 295 300
 Asp Glu Leu His Thr Ile Met Gly Ser Gly Ser Gly Ile Asp Ser Thr
 305 310 315 320
 Leu Asp Ala Ala Asn Ile Leu Lys Pro Ala Leu Ala Arg Gly Thr Leu
 325 330 335
 Arg Thr Val Gly Ala Thr Thr Gln Glu Glu Tyr Gln Lys His Ile Glu
 340 345 350
 Lys Asp Ala Ala Leu Ser Arg Arg Phe Ala Lys Val Thr Ile Glu Glu
 355 360 365

Pro Ser Val Ala Asp Ser Met Thr Ile Leu Gln Gly Leu Lys Ala Thr
 370 375 380
 Tyr Glu Lys His His Arg Val Gln Ile Thr Asp Glu Ala Val Glu Thr
 385 390 395 400
 Ala Val Lys Met Ala His Arg Tyr Leu Thr Ser Arg His Leu Pro Asp
 405 410 415
 Ser Ala Ile Asp Leu Leu Asp Glu Ala Ala Thr Val Gln Asn Lys
 420 425 430
 Ala Lys His Val Lys Ala Asp Asp Ser Asp Leu Ser Pro Ala Asp Lys
 435 440 445
 Ala Leu Met Asp Gly Lys Trp Lys Gln Ala Ala Gln Leu Ile Ala Lys
 450 455 460
 Glu Glu Glu Val Pro Val Tyr Lys Asp Leu Val Thr Glu Ser Asp Ile
 465 470 475 480
 Leu Thr Thr Leu Ser Arg Leu Ser Gly Ile Pro Val Gln Lys Leu Thr
 485 490 495
 Gln Thr Asp Ala Lys Lys Tyr Leu Asn Leu Glu Ala Glu Leu His Lys
 500 505 510
 Arg Val Ile Gly Gln Asp Gln Ala Val Ser Ser Ile Ser Arg Ala Ile
 515 520 525
 Arg Arg Asn Gln Ser Gly Ile Arg Ser His Lys Arg Pro Ile Gly Ser
 530 535 540
 Phe Met Phe Leu Gly Pro Thr Gly Val Gly Lys Thr Glu Leu Ala Lys
 545 550 555 560
 Ala Leu Ala Glu Val Leu Phe Asp Asp Glu Ser Ala Leu Ile Arg Phe
 565 570 575
 Asp Met Ser Glu Tyr Met Glu Lys Phe Ala Ala Ser Arg Leu Asn Gly
 580 585 590
 Ala Pro Pro Gly Tyr Val Gly Tyr Glu Glu Gly Gly Glu Leu Thr Glu
 595 600 605
 Lys Val Arg Asn Lys Pro Tyr Ser Val Leu Leu Phe Asp Glu Val Glu
 610 615 620
 Lys Ala His Pro Asp Ile Phe Asn Val Leu Leu Gln Val Leu Asp Asp
 625 630 635 640
 Gly Val Leu Thr Asp Ser Lys Gly Arg Lys Val Asp Phe Ser Asn Thr
 645 650 655
 Ile Ile Ile Met Thr Ser Asn Leu Gly Ala Thr Ala Leu Arg Asp Asp
 660 665 670

Lys Thr Val Gly Phe Gly Ala Lys Asp Ile Arg Phe Asp Gln Glu Asn
 675 680 685
 Met Glu Lys Arg Met Phe Glu Glu Leu Lys Lys Ala Tyr Arg Pro Glu
 690 695 700
 Phe Ile Asn Arg Ile Asp Glu Lys Val Val Phe His Ser Leu Ser Ser
 705 710 715 720
 Asp His Met Gln Glu Val Val Lys Ile Met Val Lys Pro Leu Val Ala
 725 730 735
 Ser Leu Thr Glu Lys Gly Ile Asp Leu Lys Leu Gln Ala Ser Ala Leu
 740 745 750
 Lys Leu Leu Ala Asn Gln Gly Tyr Asp Pro Glu Met Gly Ala Arg Pro
 755 760 765
 Leu Arg Arg Thr Leu Gln Thr Glu Val Glu Asp Lys Leu Ala Glu Leu
 770 775 780
 Leu Leu Lys Gly Asp Leu Val Ala Gly Ser Thr Leu Lys Ile Gly Val
 785 790 795 800
 Lys Ala Gly Gln Leu Lys Phe Asp Ile Ala
 805 810

<210> 75

<211> 1008

<212> DNA

<213> Streptococcus pneumoniae

<400> 75

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gactttatcc tagactggac accaaatacc aaccacacag ggctttatgt tgccaaggaa 180
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<210> 76

<211> 335

<212> PRT

<213> Streptococcus pneumoniae

<400> 76

Met Lys Lys Thr Trp Lys Val Phe Leu Thr Leu Val Thr Ala Leu Val
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20 25 30

Lys Glu Ala Glu Leu Lys Lys Val Asp Phe Ile Leu Asp Trp Thr Pro
35 40 45

Asn Thr Asn His Thr Gly Leu Tyr Val Ala Lys Glu Lys Gly Tyr Phe
50 55 60

Lys Glu Ala Gly Val Asp Val Asp Leu Lys Leu Pro Pro Glu Glu Ser
65 70 75 80

Ser Ser Asp Leu Val Ile Asn Gly Lys Ala Pro Phe Ala Val Tyr Phe
85 90 95

Gln Asp Tyr Met Ala Lys Lys Leu Glu Lys Gly Ala Gly Ile Thr Ala
100 105 110

Val Ala Ala Ile Val Glu His Asn Thr Ser Gly Ile Ile Ser Arg Lys
115 120 125

Ser Asp Asn Val Ser Ser Pro Lys Asp Leu Val Gly Lys Lys Tyr Gly
130 135 140

Thr Trp Asn Asp Pro Thr Glu Leu Ala Met Leu Lys Thr Leu Val Glu
145 150 155 160

Ser Gln Gly Gly Asp Phe Glu Lys Val Glu Lys Val Pro Asn Asn Asp
165 170 175

Ser Asn Ser Ile Thr Pro Ile Ala Asn Gly Val Phe Asp Thr Ala Trp
180 185 190

Ile Tyr Tyr Gly Trp Asp Gly Ile Leu Ala Lys Ser Gln Gly Val Asp
195 200 205

Ala Asn Phe Met Tyr Leu Lys Asp Tyr Val Lys Glu Phe Asp Tyr Tyr
210 215 220

Ser Pro Val Ile Ile Ala Asn Asn Asp Tyr Leu Lys Asp Asn Lys Glu
225 230 235 240

Glu Ala Arg Lys Val Ile Gln Ala Ile Lys Lys Gly Tyr Gln Tyr Ala
245 250 255

Met Glu His Pro Glu Glu Ala Ala Asp Ile Leu Ile Lys Asn Ala Pro
260 265 270

Glu Leu Lys Glu Lys Arg Asp Phe Val Ile Glu Ser Gln Lys Tyr Leu
275 280 285

Ser Lys Glu Tyr Ala Ser Asp Lys Glu Lys Trp Gly Gln Phe Asp Ala
 290 295 300

Ala Arg Trp Asn Ala Phe Tyr Lys Trp Asp Lys Glu Asn Gly Ile Leu
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Lys Glu Asp Leu Thr Asp Lys Gly Phe Thr Asn Glu Phe Val Lys
 325 330 335

<210> 77

<211> 762

<212> DNA

<213> Streptococcus pneumoniae

<400> 77

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 attttgacg gttttaggca ttgcgacaag gatatgctga cttgttttag tctgatgcgg 480
 gccaaagcct ggcaaatcct gtggcatttt aaaatcccag ttagcctgcc ttacttttat 540
 gcaggctctga gggtcagtgt ctcctacgcc tttatcacia ctgtggtatc tgagtgggtg 600
 ggaggttttg aaggtcttgg tgtttatatg attcagtcta aaaaactgtt tcagtatgat 660
 accatgtttg ccattattat tctgggtgtc attatcagtc ttttgggtat gaagctggtc 720
 gatatcagtg aaaaatatgt gattaaatgg aaacgttcgt ag 762

<210> 78

<211> 253

<212> PRT

<213> Streptococcus pneumoniae

<400> 78

Met Met Arg Asn Leu Arg Ser Ile Leu Arg Arg His Ile Ser Leu Leu
 1 5 10 15

Gly Phe Leu Gly Val Leu Ser Ile Trp Gln Leu Ala Gly Phe Leu Lys
 20 25 30

Leu Leu Pro Lys Phe Ile Leu Pro Thr Pro Leu Glu Ile Leu Gln Pro
 35 40 45

Phe Val Arg Asp Arg Glu Phe Leu Trp His His Ser Trp Ala Thr Leu
 50 55 60

Arg Val Ala Leu Leu Gly Leu Ile Leu Gly Val Leu Ile Ala Cys Leu
 65 70 75 80

Met Ala Val Leu Met Asp Ser Leu Thr Trp Leu Asn Asp Leu Ile Tyr
 85 90 95

Pro Met Met Val Val Ile Gln Thr Ile Pro Thr Ile Ala Ile Ala Pro
100 105 110

Ile Leu Val Leu Trp Leu Gly Tyr Gly Ile Leu Pro Lys Ile Val Leu
115 120 125

Ile Ile Leu Thr Thr Thr Phe Pro Ile Ile Val Ser Ile Leu Asp Gly
130 135 140

Phe Arg His Cys Asp Lys Asp Met Leu Thr Leu Phe Ser Leu Met Arg
145 150 155 160

Ala Lys Pro Trp Gln Ile Leu Trp His Phe Lys Ile Pro Val Ser Leu
165 170 175

Pro Tyr Phe Tyr Ala Gly Leu Arg Val Ser Val Ser Tyr Ala Phe Ile
180 185 190

Thr Thr Val Val Ser Glu Trp Leu Gly Gly Phe Glu Gly Leu Gly Val
195 200 205

Tyr Met Ile Gln Ser Lys Lys Leu Phe Gln Tyr Asp Thr Met Phe Ala
210 215 220

Ile Ile Ile Leu Val Ser Ile Ile Ser Leu Leu Gly Met Lys Leu Val
225 230 235 240

Asp Ile Ser Glu Lys Tyr Val Ile Lys Trp Lys Arg Ser
245 250

<210> 79
<211> 372
<212> DNA
<213> Streptococcus pneumoniae

<400> 79
ttgattttta atcctatattg ctgtatgata agggaaaaga aaggggacag agatatggct 60
tttaccaata cccacatgcg atctgctagt ttgggtattg ttaccagctt gcctgatgac 120
atcattgact ctttttggtat tatcatcgac catttcttaa aaaatgtctt tgaattggaa 180
gaagaactcg agtttcaatt gcttaataac caaggaaaga ttaccttcca cttttcaagt 240
caacacctcc ctacagccat tgattttgac tttaaccatc ctttcgaccc tcgttatccc 300
ccaagagtac tggttttaga catggacggg agagaaacta tcctcctccc agaagaaaat 360
gacctatttt aa 372

<210> 80
<211> 123
<212> PRT
<213> Streptococcus pneumoniae

<400> 80
Met Ile Phe Asn Pro Ile Cys Cys Met Ile Arg Glu Lys Lys Gly Asp
1 5 10 15
Arg Asp Met Ala Phe Thr Asn Thr His Met Arg Ser Ala Ser Phe Gly

20 25 30
 Ile Val Thr Ser Leu Pro Asp Asp Ile Ile Asp Ser Phe Trp Tyr Ile
 35 40 45
 Ile Asp His Phe Leu Lys Asn Val Phe Glu Leu Glu Glu Glu Leu Glu
 50 55 60
 Phe Gln Leu Leu Asn Asn Gln Gly Lys Ile Thr Phe His Phe Ser Ser
 65 70 75 80
 Gln His Leu Pro Thr Ala Ile Asp Phe Asp Phe Asn His Pro Phe Asp
 85 90 95
 Pro Arg Tyr Pro Pro Arg Val Leu Val Leu Asp Met Asp Gly Arg Glu
 100 105 110
 Thr Ile Leu Leu Pro Glu Glu Asn Asp Leu Phe
 115 120

<210> 81
 <211> 1645
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 81
 acagcgggtgt cattctatct attttaagaa aagtaataat caattgttaa aaatagtaaa 60
 aaaattggag gttctgatga aatattttgt tcctaataag gtattcagta ttcgtaaatt 120
 aaaggtgggg acttgctcgg tactattggc aatttcaatt ttgggaagcc aaggatatttt 180
 atcggatgaa gttgttacta gttcttcacc gatggctaca aaagagtctt ctaatgcaat 240
 tactaatgat ttagataatt caccaactgt taatcagaat cgttctgctg aaatgattgc 300
 ctctaattca accactaatg gtttagataa ttcgttaagt gttaatagca tcagctctaa 360
 tgggtactatt cgttccaatt cacaattaga caacagaaca gttgaatcta cagtaacatc 420
 tactaatgaa aataagagtt ataaggaaga tgttataagt gacagaatta tcaaaaaaga 480
 atttgaagat actgctttta gtgtaaaaga ttatgggtgca gtaggtgatg ggattcatga 540
 tgatcgacaa gcaattcaag atgcaataga tgctgcagct caagggctag gtggaggaaa 600
 tgtatatatt cctgaaggaa cttattttagt aaaagaaatt gtttttttaa aaagtcatac 660
 acacttagaa ttgaatgaga aagctacaat tctaaatggt ataaatatta agaatcacc 720
 ttccattggt tttatgacag gtttattttac ggatgatggt gcgcaagtag aatggggccc 780
 aacagaagat attagttatt ctggtggtac gattgatatg aacggtgctt tgaatgaaga 840
 aggaactaaa gcaaaaaatc taccacttat aaattcttca ggtgcatttg ctattgggaa 900
 ttcaaataac gtaactataa aaaatgtaac attcaaggat agttatcaag ggcattgctat 960
 tcaaattgca ggttcgaaaa atgtattagt tgataattct cgttttcttg ggcaagcctt 1020
 acccaaaacg atgaaggatg ggcaaatcat aagtaaggag agcattcaga ttgaaccatt 1080
 aactagaaaa ggttttcctt atgccttgaa tgatgatggg aaaaaatctg aaaatgtgac 1140
 tattcaaaat tcctattttg gcaaaagtga taaatctggg gaattagtaa cagcaattgg 1200
 cacacactat caaacattgt cgacacagaa cccctctaatt attaaaattc aaaataatca 1260
 ttttgataac atgatgtatg cagggtgtacg ttttacagga ttcactgatg tattaatcaa 1320
 aggaaatcgc tttgataaga aagttaaagg agagagtgtg cattatcgag aaagcggagc 1380
 agcttttagta aatgcttata gctataaaaa cactaaagac ctattagatt taaataaaca 1440
 ggtgggttatc gccgaaaata tatttaatat tgccgatcct aaaacaaaag cgatacgagt 1500
 tgcaaaagat agtgcagaat gtttaggaaa agtatcagat attactgtaa caaaaaatgt 1560
 aattaataat aattctaagg aaacagaaca accaaatatt gaattattac gagttagtga 1620
 taatttagta gtctcagaga atagt 1645

<210> 82
 <211> 548
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 82
 Gln Arg Cys His Ser Ile Tyr Phe Lys Lys Ser Asn Asn Gln Leu Leu
 1 5 10 15
 Lys Ile Val Lys Lys Leu Glu Val Leu Met Lys Tyr Phe Val Pro Asn
 20 25 30
 Glu Val Phe Ser Ile Arg Lys Leu Lys Val Gly Thr Cys Ser Val Leu
 35 40 45
 Leu Ala Ile Ser Ile Leu Gly Ser Gln Gly Ile Leu Ser Asp Glu Val
 50 55 60
 Val Thr Ser Ser Ser Pro Met Ala Thr Lys Glu Ser Ser Asn Ala Ile
 65 70 75 80
 Thr Asn Asp Leu Asp Asn Ser Pro Thr Val Asn Gln Asn Arg Ser Ala
 85 90 95
 Glu Met Ile Ala Ser Asn Ser Thr Thr Asn Gly Leu Asp Asn Ser Leu
 100 105 110
 Ser Val Asn Ser Ile Ser Ser Asn Gly Thr Ile Arg Ser Asn Ser Gln
 115 120 125
 Leu Asp Asn Arg Thr Val Glu Ser Thr Val Thr Ser Thr Asn Glu Asn
 130 135 140
 Lys Ser Tyr Lys Glu Asp Val Ile Ser Asp Arg Ile Ile Lys Lys Glu
 145 150 155 160
 Phe Glu Asp Thr Ala Leu Ser Val Lys Asp Tyr Gly Ala Val Gly Asp
 165 170 175
 Gly Ile His Asp Asp Arg Gln Ala Ile Gln Asp Ala Ile Asp Ala Ala
 180 185 190
 Ala Gln Gly Leu Gly Gly Gly Asn Val Tyr Phe Pro Glu Gly Thr Tyr
 195 200 205
 Leu Val Lys Glu Ile Val Phe Leu Lys Ser His Thr His Leu Glu Leu
 210 215 220
 Asn Glu Lys Ala Thr Ile Leu Asn Gly Ile Asn Ile Lys Asn His Pro
 225 230 235 240
 Ser Ile Val Phe Met Thr Gly Leu Phe Thr Asp Asp Gly Ala Gln Val
 245 250 255
 Glu Trp Gly Pro Thr Glu Asp Ile Ser Tyr Ser Gly Gly Thr Ile Asp
 260 265 270

Met Asn Gly Ala Leu Asn Glu Glu Gly Thr Lys Ala Lys Asn Leu Pro
 275 280 285

Leu Ile Asn Ser Ser Gly Ala Phe Ala Ile Gly Asn Ser Asn Asn Val
 290 295 300

Thr Ile Lys Asn Val Thr Phe Lys Asp Ser Tyr Gln Gly His Ala Ile
 305 310 315 320

Gln Ile Ala Gly Ser Lys Asn Val Leu Val Asp Asn Ser Arg Phe Leu
 325 330 335

Gly Gln Ala Leu Pro Lys Thr Met Lys Asp Gly Gln Ile Ile Ser Lys
 340 345 350

Glu Ser Ile Gln Ile Glu Pro Leu Thr Arg Lys Gly Phe Pro Tyr Ala
 355 360 365

Leu Asn Asp Asp Gly Lys Lys Ser Glu Asn Val Thr Ile Gln Asn Ser
 370 375 380

Tyr Phe Gly Lys Ser Asp Lys Ser Gly Glu Leu Val Thr Ala Ile Gly
 385 390 395 400

Thr His Tyr Gln Thr Leu Ser Thr Gln Asn Pro Ser Asn Ile Lys Ile
 405 410 415

Gln Asn Asn His Phe Asp Asn Met Met Tyr Ala Gly Val Arg Phe Thr
 420 425 430

Gly Phe Thr Asp Val Leu Ile Lys Gly Asn Arg Phe Asp Lys Lys Val
 435 440 445

Lys Gly Glu Ser Val His Tyr Arg Glu Ser Gly Ala Ala Leu Val Asn
 450 455 460

Ala Tyr Ser Tyr Lys Asn Thr Lys Asp Leu Leu Asp Leu Asn Lys Gln
 465 470 475 480

Val Val Ile Ala Glu Asn Ile Phe Asn Ile Ala Asp Pro Lys Thr Lys
 485 490 495

Ala Ile Arg Val Ala Lys Asp Ser Ala Glu Cys Leu Gly Lys Val Ser
 500 505 510

Asp Ile Thr Val Thr Lys Asn Val Ile Asn Asn Asn Ser Lys Glu Thr
 515 520 525

Glu Gln Pro Asn Ile Glu Leu Leu Arg Val Ser Asp Asn Leu Val Val
 530 535 540

Ser Glu Asn Ser
 545

<210> 83
 <211> 324
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 83
 gtgatgaaag aaactcagct attaaaaggt gttcttgaag gttgtgtctt ggatatgatt 60
 ggtcaaaaag agcgggtatgg ttatgagttg gttcagactt tgcgagagggc tggatttgat 120
 actatcgttc caggaaactat ttatcctttg ttgcaaaaagt tagaaaaaaa tcaatggata 180
 agaggcgaca tgcgcccgtc gccagatggg ccagatcgga agtatttttc attaataaaa 240
 gaaggagaag agcgtgtctc agtcttttgg caacaatggg acgattttgag tcaaaaagta 300
 gaagggatta agaatggggg ttaa 324

<210> 84
 <211> 107
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 84
 Met Met Lys Glu Thr Gln Leu Leu Lys Gly Val Leu Glu Gly Cys Val
 1 5 10 15
 Leu Asp Met Ile Gly Gln Lys Glu Arg Tyr Gly Tyr Glu Leu Val Gln
 20 25 30
 Thr Leu Arg Glu Ala Gly Phe Asp Thr Ile Val Pro Gly Thr Ile Tyr
 35 40 45
 Pro Leu Leu Gln Lys Leu Glu Lys Asn Gln Trp Ile Arg Gly Asp Met
 50 55 60
 Arg Pro Ser Pro Asp Gly Pro Asp Arg Lys Tyr Phe Ser Leu Met Lys
 65 70 75 80
 Glu Gly Glu Glu Arg Val Ser Val Phe Trp Gln Gln Trp Asp Asp Leu
 85 90 95
 Ser Gln Lys Val Glu Gly Ile Lys Asn Gly Gly
 100 105

<210> 85
 <211> 816
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 85
 atgaagaaaa tgaagtatta cgaagaaaca agcgctttgc tacatgagtt ttctgaggag 60
 aatcaaaaagt attttgagga gttgtgggaa agttttaatc ttgctggatt tctctatgat 120
 gaagactatc tcagagagca gatctatttg atgatgctag atttctcaga agcagaacga 180
 gatggcatga gtgcagagga ttatctaggt aagaatccta aaaaaataat gaaagagatt 240
 ctcaaggagg cacctcgag ttctatcaaa gagtcccttt tgacgccaat tcttgtcctg 300
 gcggtattac gttattatca actactaagt gattttttcta aaggctcctc cttaacagtc 360
 aatttgctca catttttagg gcaacttctt atttttctga ttggatttgg acttgtggcc 420
 acaattttac gaagaagttt agtccaagat tctcctaaaa tgaaaattgg cacttacatt 480

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gttgttggga ctatagttct tctagttggt ttaggatatg taggaatggc aagcttcata 540
caagaaggag ccttttatat tccggctccc tgggatagtt tgtctgtctt tacgatttcg 600
ctagttatcg gtatttggaa ttggaaagaa gcggtctttc gtccatttgt cagtatgatt 660
attgcccacg ttgtggtggg ttctctgctc cggttattatg agtggatggg aatttcaa 720
gttttcctta caaaagttat tccttttagct gtcctcttta ttggaatctt tgtcttggtc 780
cgtgggttta agaagataaa atggagtga  gtatag 816

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<210> 86

<211> 271

<212> PRT

<213> Streptococcus pneumoniae

<400> 86

```

Met Lys Lys Met Lys Tyr Tyr Glu Glu Thr Ser Ala Leu Leu His Glu
  1             5             10             15

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Phe Ser Glu Glu Asn Gln Lys Tyr Phe Glu Glu Leu Trp Glu Ser Phe
      20             25             30

```

```

Asn Leu Ala Gly Phe Leu Tyr Asp Glu Asp Tyr Leu Arg Glu Gln Ile
      35             40             45

```

```

Tyr Leu Met Met Leu Asp Phe Ser Glu Ala Glu Arg Asp Gly Met Ser
      50             55             60

```

```

Ala Glu Asp Tyr Leu Gly Lys Asn Pro Lys Lys Ile Met Lys Glu Ile
      65             70             75             80

```

```

Leu Lys Gly Ala Pro Arg Ser Ser Ile Lys Glu Ser Leu Leu Thr Pro
      85             90             95

```

```

Ile Leu Val Leu Ala Val Leu Arg Tyr Tyr Gln Leu Leu Ser Asp Phe
      100            105            110

```

```

Ser Lys Gly Pro Leu Leu Thr Val Asn Leu Leu Thr Phe Leu Gly Gln
      115            120            125

```

```

Leu Leu Ile Phe Leu Ile Gly Phe Gly Leu Val Ala Thr Ile Leu Arg
      130            135            140

```

```

Arg Ser Leu Val Gln Asp Ser Pro Lys Met Lys Ile Gly Thr Tyr Ile
      145            150            155            160

```

```

Val Val Gly Thr Ile Val Leu Leu Val Val Leu Gly Tyr Val Gly Met
      165            170            175

```

```

Ala Ser Phe Ile Gln Glu Gly Ala Phe Tyr Ile Pro Ala Pro Trp Asp
      180            185            190

```

```

Ser Leu Ser Val Phe Thr Ile Ser Leu Val Ile Gly Ile Trp Asn Trp
      195            200            205

```

```

Lys Glu Ala Val Phe Arg Pro Phe Val Ser Met Ile Ile Ala His Leu
      210            215            220

```

```

Val Val Gly Ser Leu Leu Arg Tyr Tyr Glu Trp Met Gly Ile Ser Asn

```


<211> 1260
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 89
 atgcagaatc tgaaatttgc cttttcatct atcatggctc acaagatgcg ttctttgctt 60
 actatgattg ggattattat cgggtgttca tcagttgttg tgattatggc tttgggtgat 120
 tccctatctc gtcaagtcaa taaagatatg actaaatctc agaaaaatat tagcgtcttt 180
 ttctctccta aaaaaagtaa agacgggtct tttactcaga aacaatcagc ttttacgggt 240
 tctggaaagg aagaggaagt tcctgttgaa ccgccaaaac cgcaagaatc ctgggtccaa 300
 gaggcagcta aactgaaggg agtggatagt tactatgtaa ccaattcaac gaatgccatc 360
 ttgacctatc aagataaaaa gggtgagaat gctaatttga cagggtggaaa cagaacttac 420
 atggacgctg ttaagaatga aattattgca ggtagtagtc tgagagagca agatttcaaa 480
 gagtttgcaa gtgtcatttt gctagatgag gaattgtcca ttagtttatt tgaatctcct 540
 caagaggcta ttaacaagggt tgtagaagtc aatggattta gttaccgggt cattgggggt 600
 tatactagtc cggaggctaa aagatcaaaa atatatgggt ttggtggctt gcctattact 660
 accaatatct cccttgctgc gaattttaat gtagatgaaa tagctaatat tgtctttcga 720
 gtgaatgata ccagtttaac cccaactctg ggtccagAAC tggcacgaaa aatgacagag 780
 cttgcaggct tacaacaggg agaataccag gtggcagatg agtccgttgt atttgagaa 840
 attcaacaat cgtttagttt tatgacgacg attattagtt ccatcgagcagg gatttctctc 900
 tttgttgagg gaactggtgt catgaacatc atgctggttt cggtgacaga gcgcactcgt 960
 gagattggtc ttcgtaaggc tttgggtgca acacgtgccca atattttaat tcagtttttg 1020
 attgaatcca tgattttgac cttgttaggt ggcttaattg gcttgacaat tgcaagtggg 1080
 ttaactgcct tagcagggtt gttactgcaa ggtttaatag aaggtataga agttggagta 1140
 tcaatcccag tcgccctatt tagtcttgca gtttcggcta gtgttggtat gatttttgga 1200
 gtcttgccag ccaacaaggc atcgaaactt gatccaattg aagcccttcg ttatgaatga 1260

<210> 90
 <211> 419
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 90
 Met Gln Asn Leu Lys Phe Ala Phe Ser Ser Ile Met Ala His Lys Met
 1 5 10 15
 Arg Ser Leu Leu Thr Met Ile Gly Ile Ile Ile Gly Val Ser Ser Val
 20 25 30
 Val Val Ile Met Ala Leu Gly Asp Ser Leu Ser Arg Gln Val Asn Lys
 35 40 45
 Asp Met Thr Lys Ser Gln Lys Asn Ile Ser Val Phe Phe Ser Pro Lys
 50 55 60
 Lys Ser Lys Asp Gly Ser Phe Thr Gln Lys Gln Ser Ala Phe Thr Val
 65 70 75 80
 Ser Gly Lys Glu Glu Glu Val Pro Val Glu Pro Pro Lys Pro Gln Glu
 85 90 95
 Ser Trp Val Gln Glu Ala Ala Lys Leu Lys Gly Val Asp Ser Tyr Tyr
 100 105 110
 Val Thr Asn Ser Thr Asn Ala Ile Leu Thr Tyr Gln Asp Lys Lys Val
 115 120 125

Glu Asn Ala Asn Leu Thr Gly Gly Asn Arg Thr Tyr Met Asp Ala Val
 130 135 140
 Lys Asn Glu Ile Ile Ala Gly Arg Ser Leu Arg Glu Gln Asp Phe Lys
 145 150 155 160
 Glu Phe Ala Ser Val Ile Leu Leu Asp Glu Glu Leu Ser Ile Ser Leu
 165 170 175
 Phe Glu Ser Pro Gln Glu Ala Ile Asn Lys Val Val Glu Val Asn Gly
 180 185 190
 Phe Ser Tyr Arg Val Ile Gly Val Tyr Thr Ser Pro Glu Ala Lys Arg
 195 200 205
 Ser Lys Ile Tyr Gly Phe Gly Gly Leu Pro Ile Thr Thr Asn Ile Ser
 210 215 220
 Leu Ala Ala Asn Phe Asn Val Asp Glu Ile Ala Asn Ile Val Phe Arg
 225 230 235 240
 Val Asn Asp Thr Ser Leu Thr Pro Thr Leu Gly Pro Glu Leu Ala Arg
 245 250 255
 Lys Met Thr Glu Leu Ala Gly Leu Gln Gln Gly Glu Tyr Gln Val Ala
 260 265 270
 Asp Glu Ser Val Val Phe Ala Glu Ile Gln Gln Ser Phe Ser Phe Met
 275 280 285
 Thr Thr Ile Ile Ser Ser Ile Ala Gly Ile Ser Leu Phe Val Gly Gly
 290 295 300
 Thr Gly Val Met Asn Ile Met Leu Val Ser Val Thr Glu Arg Thr Arg
 305 310 315 320
 Glu Ile Gly Leu Arg Lys Ala Leu Gly Ala Thr Arg Ala Asn Ile Leu
 325 330 335
 Ile Gln Phe Leu Ile Glu Ser Met Ile Leu Thr Leu Leu Gly Gly Leu
 340 345 350
 Ile Gly Leu Thr Ile Ala Ser Gly Leu Thr Ala Leu Ala Gly Leu Leu
 355 360 365
 Leu Gln Gly Leu Ile Glu Gly Ile Glu Val Gly Val Ser Ile Pro Val
 370 375 380
 Ala Leu Phe Ser Leu Ala Val Ser Ala Ser Val Gly Met Ile Phe Gly
 385 390 395 400
 Val Leu Pro Ala Asn Lys Ala Ser Lys Leu Asp Pro Ile Glu Ala Leu
 405 410 415
 Arg Tyr Glu

<210> 91
 <211> 705
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 91
 ctgatgaagc aactaattag tctaaaaaat atcttcagaa gttaccgtaa tggtagaccaa 60
 gaactgcagg ttctcaaaaa tatcaatcta gaagtgaatg aggggtgaatt tgtagccatc 120
 atgggaccat ctgggtctgg taagtccact ctgatgaata cgattggcat gttggataca 180
 ccaaccagtg gagaatatta tcttgaagggt caagaagtgg ctgggcttgg tgaaaaacaa 240
 ctagctaaagg tccgtaacca acaaatcggt tttgtctttc agcagttctt tcttctatcg 300
 aagctcaatg ctctgcaaaa tgtagaattg cccttgattt acgcaggagt ttcgtcttca 360
 aaacgctcgca agttggctga ggaatattta gacaagggtg aattgacaga acgtagtcac 420
 catttacctt cagaattatc tgggtggtcaa aagcaacgtg tagccattgc gcgtgccttg 480
 gtaaacaaatc cttctattat cctagcggat gaaccgacag gagccttgga taccaaaaaca 540
 ggtaaccaaa ttatgcaatt attggttgat ttgaataaag aaggaaaaac cattatcatg 600
 gtaacgcatg agcctgagat tgctgcctat gccaaacgtc agattgtcat tcgggatggg 660
 gtcatttcgt ctgacagtgc tcagtttagga aaggaggaaa actaa 705

<210> 92
 <211> 234
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 92
 Met Met Lys Gln Leu Ile Ser Leu Lys Asn Ile Phe Arg Ser Tyr Arg
 1 5 10 15
 Asn Gly Asp Gln Glu Leu Gln Val Leu Lys Asn Ile Asn Leu Glu Val
 20 25 30
 Asn Glu Gly Glu Phe Val Ala Ile Met Gly Pro Ser Gly Ser Gly Lys
 35 40 45
 Ser Thr Leu Met Asn Thr Ile Gly Met Leu Asp Thr Pro Thr Ser Gly
 50 55 60
 Glu Tyr Tyr Leu Glu Gly Gln Glu Val Ala Gly Leu Gly Glu Lys Gln
 65 70 75 80
 Leu Ala Lys Val Arg Asn Gln Gln Ile Gly Phe Val Phe Gln Gln Phe
 85 90 95
 Phe Leu Leu Ser Lys Leu Asn Ala Leu Gln Asn Val Glu Leu Pro Leu
 100 105 110
 Ile Tyr Ala Gly Val Ser Ser Ser Lys Arg Arg Lys Leu Ala Glu Glu
 115 120 125
 Tyr Leu Asp Lys Val Glu Leu Thr Glu Arg Ser His His Leu Pro Ser
 130 135 140
 Glu Leu Ser Gly Gly Gln Lys Gln Arg Val Ala Ile Ala Arg Ala Leu

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      .   .   .
145              150              155              160
Val Asn Asn Pro Ser Ile Ile Leu Ala Asp Glu Pro Thr Gly Ala Leu
      165              170              175
Asp Thr Lys Thr Gly Asn Gln Ile Met Gln Leu Leu Val Asp Leu Asn
      180              185              190
Lys Glu Gly Lys Thr Ile Ile Met Val Thr His Glu Pro Glu Ile Ala
      195              200              205
Ala Tyr Ala Lys Arg Gln Ile Val Ile Arg Asp Gly Val Ile Ser Ser
      210              215              220
Asp Ser Ala Gln Leu Gly Lys Glu Glu Asn
225              230

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<210> 93
<211> 1200
<212> DNA
<213> Streptococcus pneumoniae

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<400> 93
atgaagaaaa agaattggttaa agctaaaaaag tggcaactgt atgcagcaat cgggtgctgcg 60
agtgtagttg tattgggtgc tggggggatt ttactcttta gacaaccttc tcagactgct 120
ctaaaagatg agcctactca tcttggtgtt gccaaaggaag gaagcgtggc ctctctgtt 180
ttattgtcag ggacagtaac agcaaaaaat gaacaatatg tttattttga tgctagtaag 240
ggtgatttag atgaaatcct tgtttctgtg ggcgataagg tcagcgaagg gcaggcttta 300
gtcaagtaca gtagttcaga agcgcaggcg gcctatgatt cagctagtcg agcagtagct 360
agggcagatc gtcatatcaa tgaactcaat caagcacgaa atgaagccgc ttcagctccg 420
gctccacagt taccagcgcc agtaggagga gaagatgcaa cgggtgcaaag cccaactcca 480
gtggctggaa attctgttgc ttctattgac gctcaattgg gtgatgcccg tgatgcgcgt 540
gcagatgctg cggcgcaatt aagcaaggct caaagtcaat tggatgcaac aactgttctc 600
agtaccctag agggaaactgt ggtcgaagtc aatagcaatg tttctaaatc tccaacaggg 660
gcgagtcaag ttatggttca tattgtcagc aatgaaaatt tacaagtcaa gggagaattg 720
tctgagtaca atctagccaa cctttctgta ggtcaagaag taagctttac ttctaaagtg 780
tatcctgata aaaaatggac tgggaaatta agctatattt ctgactatcc taaaaacaat 840
ggtgaagcag ctagtccagc agccgggaat aatacagggt cttaaataccc ttatactatt 900
gatgtgacag gcgaggttgg tgatttgaaa caagggtttt ctgtcaacat tgagggttaaa 960
agcaaaacta aggctattct tgttcctgtt agcagtcctag taatggatga tagtaaaaat 1020
tatgtctgga ttgtggatga acaacaaaag gctaaaaaag ttgaggtttc attgggaaat 1080
gctgacgcag aaaatcaaga aatcacttct ggtttaacga acggtgctaa ggtcatcagt 1140
aatccaacat cttccttgga agaaggaaaa gaggtgaagg ctgatgaagc aactaattag 1200

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<210> 94
<211> 399
<212> PRT
<213> Streptococcus pneumoniae

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```

<400> 94
Met Lys Lys Lys Asn Gly Lys Ala Lys Lys Trp Gln Leu Tyr Ala Ala
  1              5              10              15
Ile Gly Ala Ala Ser Val Val Val Leu Gly Ala Gly Gly Ile Leu Leu

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| | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|--|--|--|
| | | | 20 | | | | | 25 | | | | | | | | 30 | | | |
| Phe | Arg | Gln | Pro | Ser | Gln | Thr | Ala | Leu | Lys | Asp | Glu | Pro | Thr | His | Leu | | | | |
| | | 35 | | | | | 40 | | | | | 45 | | | | | | | |
| Val | Val | Ala | Lys | Glu | Gly | Ser | Val | Ala | Ser | Ser | Val | Leu | Leu | Ser | Gly | | | | |
| | 50 | | | | | 55 | | | | | 60 | | | | | | | | |
| Thr | Val | Thr | Ala | Lys | Asn | Glu | Gln | Tyr | Val | Tyr | Phe | Asp | Ala | Ser | Lys | | | | |
| | 65 | | | | 70 | | | | | 75 | | | | | 80 | | | | |
| Gly | Asp | Leu | Asp | Glu | Ile | Leu | Val | Ser | Val | Gly | Asp | Lys | Val | Ser | Glu | | | | |
| | | | | 85 | | | | | 90 | | | | | 95 | | | | | |
| Gly | Gln | Ala | Leu | Val | Lys | Tyr | Ser | Ser | Ser | Glu | Ala | Gln | Ala | Ala | Tyr | | | | |
| | | | 100 | | | | | 105 | | | | | 110 | | | | | | |
| Asp | Ser | Ala | Ser | Arg | Ala | Val | Ala | Arg | Ala | Asp | Arg | His | Ile | Asn | Glu | | | | |
| | | 115 | | | | | 120 | | | | | 125 | | | | | | | |
| Leu | Asn | Gln | Ala | Arg | Asn | Glu | Ala | Ala | Ser | Ala | Pro | Ala | Pro | Gln | Leu | | | | |
| | 130 | | | | | 135 | | | | | 140 | | | | | | | | |
| Pro | Ala | Pro | Val | Gly | Gly | Glu | Asp | Ala | Thr | Val | Gln | Ser | Pro | Thr | Pro | | | | |
| | 145 | | | | 150 | | | | | 155 | | | | | 160 | | | | |
| Val | Ala | Gly | Asn | Ser | Val | Ala | Ser | Ile | Asp | Ala | Gln | Leu | Gly | Asp | Ala | | | | |
| | | | | 165 | | | | | 170 | | | | | 175 | | | | | |
| Arg | Asp | Ala | Arg | Ala | Asp | Ala | Ala | Ala | Gln | Leu | Ser | Lys | Ala | Gln | Ser | | | | |
| | | | 180 | | | | | 185 | | | | | 190 | | | | | | |
| Gln | Leu | Asp | Ala | Thr | Thr | Val | Leu | Ser | Thr | Leu | Glu | Gly | Thr | Val | Val | | | | |
| | | 195 | | | | | 200 | | | | | 205 | | | | | | | |
| Glu | Val | Asn | Ser | Asn | Val | Ser | Lys | Ser | Pro | Thr | Gly | Ala | Ser | Gln | Val | | | | |
| | 210 | | | | | 215 | | | | | 220 | | | | | | | | |
| Met | Val | His | Ile | Val | Ser | Asn | Glu | Asn | Leu | Gln | Val | Lys | Gly | Glu | Leu | | | | |
| | 225 | | | | 230 | | | | | 235 | | | | | 240 | | | | |
| Ser | Glu | Tyr | Asn | Leu | Ala | Asn | Leu | Ser | Val | Gly | Gln | Glu | Val | Ser | Phe | | | | |
| | | | | 245 | | | | | 250 | | | | | 255 | | | | | |
| Thr | Ser | Lys | Val | Tyr | Pro | Asp | Lys | Lys | Trp | Thr | Gly | Lys | Leu | Ser | Tyr | | | | |
| | | | 260 | | | | | 265 | | | | | 270 | | | | | | |
| Ile | Ser | Asp | Tyr | Pro | Lys | Asn | Asn | Gly | Glu | Ala | Ala | Ser | Pro | Ala | Ala | | | | |
| | | 275 | | | | | 280 | | | | | 285 | | | | | | | |
| Gly | Asn | Asn | Thr | Gly | Ser | Lys | Tyr | Pro | Tyr | Thr | Ile | Asp | Val | Thr | Gly | | | | |
| | 290 | | | | | 295 | | | | | 300 | | | | | | | | |
| Glu | Val | Gly | Asp | Leu | Lys | Gln | Gly | Phe | Ser | Val | Asn | Ile | Glu | Val | Lys | | | | |
| | 305 | | | | 310 | | | | | 315 | | | | | 320 | | | | |
| Ser | Lys | Thr | Lys | Ala | Ile | Leu | Val | Pro | Val | Ser | Ser | Leu | Val | | | | | | |

Pro Gln Val Leu Lys Glu Ile Gly Thr Asp Tyr Val Val Ile Gly His
 85 90 95
 Ser Glu Arg Arg Asp Tyr Phe His Glu Thr Asp Glu Asp Ile Asn Lys
 100 105 110
 Lys Ala Lys Ala Ile Phe Ala Asn Gly Met Leu Pro Ile Ile Cys Cys
 115 120 125
 Gly Glu Ser Leu Glu Thr Tyr Glu Ala Gly Lys Ala Ala Glu Phe Val
 130 135 140
 Gly Ala Gln Val Ser Ala Ala Leu Ala Gly Leu Thr Ala Glu Gln Val
 145 150 155 160
 Ala Ala Ser Val Ile Ala Tyr Glu Pro Ile Trp Ala Ile Gly Thr Gly
 165 170 175
 Lys Ser Ala Ser Gln Asp Asp Ala Gln Lys Met Cys Lys Val Val Arg
 180 185 190
 Asp Val Val Ala Ala Asp Phe Gly Gln Glu Val Ala Asp Lys Val Arg
 195 200 205
 Val Gln Tyr Gly Gly Ser Val Lys Pro Glu Asn Val Ala Ser Tyr Met
 210 215 220
 Ala Cys Pro Asp Val Asp Gly Ala Leu Val Gly Gly Ala Ser Leu Glu
 225 230 235 240
 Ala Glu Ser Phe Leu Ala Leu Leu Asp Phe Val Lys
 245 250

<210> 97
 <211> 1473
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 97
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 gctgcaaatg aaactgaagt agcaaaaact tcgcaggata caacgacagc ttcaagtagt 120
 tcagagcaaa atcagtcctc taataaaacg caaacgagcg cagaagtaca gactaatgct 180
 gctgcccact gggatgggga ttattatgta aaggatgatg gttctaaagc tcaaagtga 240
 tggatttttg acaactacta taaggcttgg ttttatatta attcagatgg tcgttactcg 300
 cagaatgaat ggcattgaaa ttactacctg aaatcagggtg gatatatggc caaaacgag 360
 tggatctatg acagtaatta caagagttgg ttttatctca agtcagatgg ggcttatgct 420
 catcaagaat ggcaattgat tggaaataag tgggtactact tcaagaagtg gggttacatg 480
 gctaaaagcc aatggcaagg aagttatttc ttgaatgggc aaggagctat gatgcaaaat 540
 gaatggctct atgatccagc ctattctgct tatttttatc taaaatccga tggaacttat 600
 gctaaccaag agtggcaaaa agtgggcggc aaatgggtact atttcaagaa gtggggctat 660
 atggctcgga atgagtggca aggcaactac tatttgactg gaagtgggtg catggcgact 720
 gacgaagtga ttatggatgg tactcgctat atctttgcgg cctctgggtg gctcaaagaa 780
 aaaaagatt tgaatgtcgg ctgggttcac agagatggta agcgtatatt ctttaataat 840
 agagaagaac aagtgggaac cgaacatgct aagaaagtca ttgatattag tgagcacaat 900

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ggtcgtatca atgattggaa aaagggttatt gatgagaacg aagtggatgg tgtcattggt 960
cgtctagggt atagcggtaa agaagacaag gaattggcgc ataacattaa ggagttaaag 1020
cgtctgggaa ttccttatgg tgtctatctc tatacctatg ctgaaaatga gaccgatgct 1080
gagagtgcag ctaaacagac cattgaactt ataaagaaat acaatatgaa cctgtcttac 1140
cctatctatt atgatgttga gaattgggaa tatgtaaata agagcaagag agctccaagt 1200
gatacaggca cttggggttaa aatcatcaac aagtacatgg acacgatgaa gcaggcgggt 1260
tatcaaaatg tgtatgtcta tagctatcgt agtttattac agacgcgttt aaaacacca 1320
gatattttta aacatgtaaa ctgggtagcg gcctatacga atgctttaga atgggaaaac 1380
cctcattatt caggaaaaaa aggttggaag tatacctctt ctgaatacat gaaaggaatc 1440
caagggcgcg tagatgtcag cgtttggtat taa 1473

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<210> 98

<211> 490

<212> PRT

<213> Streptococcus pneumoniae

<400> 98

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Met Lys Thr Lys Ile Gly Leu Ala Ser Ile Cys Leu Leu Gly Leu Ala
  1             5             10             15

```

```

Thr Ser His Val Ala Ala Asn Glu Thr Glu Val Ala Lys Thr Ser Gln
      20             25             30

```

```

Asp Thr Thr Thr Ala Ser Ser Ser Ser Glu Gln Asn Gln Ser Ser Asn
      35             40             45

```

```

Lys Thr Gln Thr Ser Ala Glu Val Gln Thr Asn Ala Ala Ala His Trp
      50             55             60

```

```

Asp Gly Asp Tyr Tyr Val Lys Asp Asp Gly Ser Lys Ala Gln Ser Glu
      65             70             75             80

```

```

Trp Ile Phe Asp Asn Tyr Tyr Lys Ala Trp Phe Tyr Ile Asn Ser Asp
      85             90             95

```

```

Gly Arg Tyr Ser Gln Asn Glu Trp His Gly Asn Tyr Tyr Leu Lys Ser
      100            105            110

```

```

Gly Gly Tyr Met Ala Gln Asn Glu Trp Ile Tyr Asp Ser Asn Tyr Lys
      115            120            125

```

```

Ser Trp Phe Tyr Leu Lys Ser Asp Gly Ala Tyr Ala His Gln Glu Trp
      130            135            140

```

```

Gln Leu Ile Gly Asn Lys Trp Tyr Tyr Phe Lys Lys Trp Gly Tyr Met
      145            150            155            160

```

```

Ala Lys Ser Gln Trp Gln Gly Ser Tyr Phe Leu Asn Gly Gln Gly Ala
      165            170            175

```

```

Met Met Gln Asn Glu Trp Leu Tyr Asp Pro Ala Tyr Ser Ala Tyr Phe
      180            185            190

```

```

Tyr Leu Lys Ser Asp Gly Thr Tyr Ala Asn Gln Glu Trp Gln Lys Val
      195            200            205

```

Gly Gly Lys Trp Tyr Tyr Phe Lys Lys Trp Gly Tyr Met Ala Arg Asn
 210 215 220
 Glu Trp Gln Gly Asn Tyr Tyr Leu Thr Gly Ser Gly Ala Met Ala Thr
 225 230 235 240
 Asp Glu Val Ile Met Asp Gly Thr Arg Tyr Ile Phe Ala Ala Ser Gly
 245 250 255
 Glu Leu Lys Glu Lys Lys Asp Leu Asn Val Gly Trp Val His Arg Asp
 260 265 270
 Gly Lys Arg Tyr Phe Phe Asn Asn Arg Glu Glu Gln Val Gly Thr Glu
 275 280 285
 His Ala Lys Lys Val Ile Asp Ile Ser Glu His Asn Gly Arg Ile Asn
 290 295 300
 Asp Trp Lys Lys Val Ile Asp Glu Asn Glu Val Asp Gly Val Ile Val
 305 310 315 320
 Arg Leu Gly Tyr Ser Gly Lys Glu Asp Lys Glu Leu Ala His Asn Ile
 325 330 335
 Lys Glu Leu Asn Arg Leu Gly Ile Pro Tyr Gly Val Tyr Leu Tyr Thr
 340 345 350
 Tyr Ala Glu Asn Glu Thr Asp Ala Glu Ser Asp Ala Lys Gln Thr Ile
 355 360 365
 Glu Leu Ile Lys Lys Tyr Asn Met Asn Leu Ser Tyr Pro Ile Tyr Tyr
 370 375 380
 Asp Val Glu Asn Trp Glu Tyr Val Asn Lys Ser Lys Arg Ala Pro Ser
 385 390 395 400
 Asp Thr Gly Thr Trp Val Lys Ile Ile Asn Lys Tyr Met Asp Thr Met
 405 410 415
 Lys Gln Ala Gly Tyr Gln Asn Val Tyr Val Tyr Ser Tyr Arg Ser Leu
 420 425 430
 Leu Gln Thr Arg Leu Lys His Pro Asp Ile Leu Lys His Val Asn Trp
 435 440 445
 Val Ala Ala Tyr Thr Asn Ala Leu Glu Trp Glu Asn Pro His Tyr Ser
 450 455 460
 Gly Lys Lys Gly Trp Gln Tyr Thr Ser Ser Glu Tyr Met Lys Gly Ile
 465 470 475 480
 Gln Gly Arg Val Asp Val Ser Val Trp Tyr
 485 490

<210> 99

<211> 774
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 99
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 agctggactc actttgaaac catgtttgga gatgggagac tcatgctgat tttggctcag 180
 acatttttct tggccttctc atcagccttg atagcgacca ttatcgggac ttttggtgcc 240
 atttacatct accagtctcg taagaaatac caagaagcct ttctatcact caataatata 300
 ctcattggtg cgctgacgt tatgattggt gctagcttct tgattctctt taccctaact 360
 aagttttcac ttggcttttt gaccgttcta tctagtcacg tggccttctc cattcctatc 420
 gtggtcttga tgggtcttgcc tcgactcaag gaaatgaatg gcgacatgat tcatgcggcc 480
 tatgacttgg gagctagtca atttcagatg ttcaaggaaa tcatgcttcc ttacctgact 540
 ccgtctatca ttactgggta tttcatggcc ttcacctatt cgtagatga ctttgccgtg 600
 accttctttg taacaggaaa tggcttttca accctatcag tcgagattta ctctcggtg 660
 cgcaagggga tttccttaga aatcaatgcc ctgtctgctc tagtctttct ctttagtatt 720
 atcctagtgt taggttatta ctttatctct cgtgagaagg aggagcaagc atga 774

<210> 100
 <211> 257
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 100
 Met Lys Lys Phe Ala Asn Leu Tyr Leu Gly Leu Val Phe Leu Val Leu
 1 5 10 15
 Tyr Leu Pro Ile Phe Tyr Leu Ile Gly Tyr Ala Phe Asn Ala Gly Asp
 20 25 30
 Asp Met Asn Ser Phe Thr Gly Phe Ser Trp Thr His Phe Glu Thr Met
 35 40 45
 Phe Gly Asp Gly Arg Leu Met Leu Ile Leu Ala Gln Thr Phe Phe Leu
 50 55 60
 Ala Phe Leu Ser Ala Leu Ile Ala Thr Ile Ile Gly Thr Phe Gly Ala
 65 70 75 80
 Ile Tyr Ile Tyr Gln Ser Arg Lys Lys Tyr Gln Glu Ala Phe Leu Ser
 85 90 95
 Leu Asn Asn Ile Leu Met Val Ala Pro Asp Val Met Ile Gly Ala Ser
 100 105 110
 Phe Leu Ile Leu Phe Thr Gln Leu Lys Phe Ser Leu Gly Phe Leu Thr
 115 120 125
 Val Leu Ser Ser His Val Ala Phe Ser Ile Pro Ile Val Val Leu Met
 130 135 140
 Val Leu Pro Arg Leu Lys Glu Met Asn Gly Asp Met Ile His Ala Ala
 145 150 155 160
 Tyr Asp Leu Gly Ala Ser Gln Phe Gln Met Phe Lys Glu Ile Met Leu

165 170 175
 Pro Tyr Leu Thr Pro Ser Ile Ile Thr Gly Tyr Phe Met Ala Phe Thr
 180 185 190
 Tyr Ser Leu Asp Asp Phe Ala Val Thr Phe Phe Val Thr Gly Asn Gly
 195 200 205
 Phe Ser Thr Leu Ser Val Glu Ile Tyr Ser Arg Ala Arg Lys Gly Ile
 210 215 220
 Ser Leu Glu Ile Asn Ala Leu Ser Ala Leu Val Phe Leu Phe Ser Ile
 225 230 235 240
 Ile Leu Val Val Gly Tyr Tyr Phe Ile Ser Arg Glu Lys Glu Glu Gln
 245 250 255

Ala

<210> 101
 <211> 1071
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 101
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 attgcgactc atttagatag taaaatcaat agtcgagata gtcaaaaatt ggttatctat 120
 aactggggag actatatcga tcctgaactc ttgactcagt ttacagaaga aacaggaatt 180
 caagttcagt acgagacttt tgactccaac gaagccatgt acactaagat aaagcagggg 240
 ggaacgacct acgatattgc cattccaagt gaatacatga ttaacaagat gaaggacgaa 300
 gacctcttgg ttccgcttga ttattcaaaa attgaaggaa tcgaaaatat cggaccagag 360
 tttctcaacc agtcctttga cccaggtaat aaattctcca tcccttactt ctgggggaacc 420
 ttaggaattg tctacaacga aaccatggta gatgaagcgc ctgagcattg ggatgacctt 480
 tggaagccgg agtataagaa ttctatcatg ctctttgatg gggcgcgatg ggtgctggga 540
 ctaggactca attccctcgg ctacagcctc aactccaagg atctgcagca gttggaagag 600
 acagtggata agctctacaa actgactcca aatatcaagg ctatcggttg ggacgagatg 660
 aagggtctata tgattcagaa taatgttgca atcggcgatg ccttctcttg tgaagccagc 720
 caaatgttag aaaaaaatga aaatctacgt tatgtggtac cgacagaggc cagcaatctt 780
 tggtttgaca atatgggtcat tcccaaaaca gttaaaaacc aaaactcagc ctatgccttt 840
 atcaacttta tgttgaaacc tgaaaatgct ctccaaaatg cggagtatgt cggctattca 900
 acaccaaaccc taccagcgaa ggaattgctc ccagaggaaa caaaggaaga taaggccttc 960
 tatcccgatg ttgaaacccat gaaacaccta gaagtttatg agaaatttga ccataaatgg 1020
 acagggaaat atagcgacct cttcctacag tttaaaatgt atcggaagta g 1071

<210> 102
 <211> 356
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 102
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Val Leu Trp Gly Ile Ala Thr His Leu Asp Ser Lys Ile Asn Ser Arg
20 25 30
Asp Ser Gln Lys Leu Val Ile Tyr Asn Trp Gly Asp Tyr Ile Asp Pro
35 40 45
Glu Leu Leu Thr Gln Phe Thr Glu Glu Thr Gly Ile Gln Val Gln Tyr
50 55 60
Glu Thr Phe Asp Ser Asn Glu Ala Met Tyr Thr Lys Ile Lys Gln Gly
65 70 75 80
Gly Thr Thr Tyr Asp Ile Ala Ile Pro Ser Glu Tyr Met Ile Asn Lys
85 90 95
Met Lys Asp Glu Asp Leu Leu Val Pro Leu Asp Tyr Ser Lys Ile Glu
100 105 110
Gly Ile Glu Asn Ile Gly Pro Glu Phe Leu Asn Gln Ser Phe Asp Pro
115 120 125
Gly Asn Lys Phe Ser Ile Pro Tyr Phe Trp Gly Thr Leu Gly Ile Val
130 135 140
Tyr Asn Glu Thr Met Val Asp Glu Ala Pro Glu His Trp Asp Asp Leu
145 150 155 160
Trp Lys Pro Glu Tyr Lys Asn Ser Ile Met Leu Phe Asp Gly Ala Arg
165 170 175
Glu Val Leu Gly Leu Gly Leu Asn Ser Leu Gly Tyr Ser Leu Asn Ser
180 185 190
Lys Asp Leu Gln Gln Leu Glu Glu Thr Val Asp Lys Leu Tyr Lys Leu
195 200 205
Thr Pro Asn Ile Lys Ala Ile Val Ala Asp Glu Met Lys Gly Tyr Met
210 215 220
Ile Gln Asn Asn Val Ala Ile Gly Val Thr Phe Ser Gly Glu Ala Ser
225 230 235 240
Gln Met Leu Glu Lys Asn Glu Asn Leu Arg Tyr Val Val Pro Thr Glu
245 250 255
Ala Ser Asn Leu Trp Phe Asp Asn Met Val Ile Pro Lys Thr Val Lys
260 265 270
Asn Gln Asn Ser Ala Tyr Ala Phe Ile Asn Phe Met Leu Lys Pro Glu
275 280 285
Asn Ala Leu Gln Asn Ala Glu Tyr Val Gly Tyr Ser Thr Pro Asn Leu
290 295 300
Pro Ala Lys Glu Leu Leu Pro Glu Glu Thr Lys Glu Asp Lys Ala Phe
305 310 315 320

Tyr Pro Asp Val Glu Thr Met Lys His Leu Glu Val Tyr Glu Lys Phe
 325 330 335

Asp His Lys Trp Thr Gly Lys Tyr Ser Asp Leu Phe Leu Gln Phe Lys
 340 345 350

Met Tyr Arg Lys
 355

<210> 103
 <211> 1851
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 103
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 aagcaggttt tctggggaat atttgatatt ttcagtatgg tggtttccat cattgtatct 120
 tatattttat tttatgggct gattaatcca gcacctgttg actacattat ctatacgagt 180
 ttggccttcc tgttctatca attgatgatt gggtttttggg ggttgaacgc gagcattagt 240
 cgttacagca agattacgga tttcatgaaa atcttttttg gtgtgactgc tagcagtgtc 300
 ttgtcatata gtatctgtta tgccttcttg ccaactcttct ccatccgttt catcattctc 360
 tttatcttgt tgagtacctt cttgatttta ttgccacgga ttacttggca gttaatctac 420
 tccagacgca aaaaaggtag tggatgatgga gaacaccgtc ggaccttctt gattggtgcc 480
 ggtgatggtg gggctctttt tatggatagt taccaacatc caaccagtga attagaactg 540
 gtcggatatt tggataagga ttctaagaaa aagggtcaaa aacttgggtg tattcctgtt 600
 ttgggctctt atgacaatct gcctgaatta gccaaacgcc atcaaatcga gcgtgtcatc 660
 gttgcgattc cgtcgttgga tccgtcagaa tatgagcgta tcttgcagat gtgtaataag 720
 ctgggtgtca aatgttacaa gatgcctaag gttgaaactg ttgttcaggg ccttcaccaa 780
 gcaggtactg gcttccaaaa aattgatatt acggaccttt tgggtcgtca ggaaatccgt 840
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 ggaggttcaa tcggttctga aatctgtcgt caagttagtc gcttcaatcc tgaacgcatt 960
 gtcttgtctg gtcattggga aaactcaatc taccttgttt atcatgaatt gattcgttaag 1020
 ttccaaggga ttgattatgt acctgtgatt gcggacattc aagactatga tcgtttgttg 1080
 caagtctttg agcagtacaa acctgctatt gtttatcatg cggcagccca caagcatgtt 1140
 cctatgatgg agcgaatcc aaaagaagcc ttcaaaaaaca atatccgtgg aacttacaat 1200
 gttgctaagg ctgttgatga agctaaagtg tctaagatgg ttatgatttc gacagataag 1260
 gcagtcaatc caccaaatgt tatgggagca accaagcgcg tggcggagtt gattgtcact 1320
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 agccgtggta gtgtcattcc agtctttgaa cgtcagattg ctgaagggtg gcctgtaacg 1440
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 gtcaagattt atgacttggc caagaagatg gtgcttctaa gtggccacac tgaaagtga 1620
 attccaatcg ttgaagttgg aatccgcccc ggtgaaaaac tctacgaaga actcttggt 1680
 tcaaccgaac tcgttgataa tcaagttatg gataagattt tcgttggtta ggttaatgtc 1740
 atgccttttag aatccatcaa tcaaaagatt ggagagttcc gcactctcag tggagatgag 1800
 ttgaagcaag ctattatcgc ctttgctaat caaacaaccc acattgaata a 1851

<210> 104
 <211> 616
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 104
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1 5 10 15
 Asn Lys Gln Gln Lys Gln Val Phe Trp Gly Ile Phe Asp Ile Phe Ser
 20 25 30
 Met Val Val Ser Ile Ile Val Ser Tyr Ile Leu Phe Tyr Gly Leu Ile
 35 40 45
 Asn Pro Ala Pro Val Asp Tyr Ile Ile Tyr Thr Ser Leu Ala Phe Leu
 50 55 60
 Phe Tyr Gln Leu Met Ile Gly Phe Trp Gly Leu Asn Ala Ser Ile Ser
 65 70 75 80
 Arg Tyr Ser Lys Ile Thr Asp Phe Met Lys Ile Phe Phe Gly Val Thr
 85 90 95
 Ala Ser Ser Val Leu Ser Tyr Ser Ile Cys Tyr Ala Phe Leu Pro Leu
 100 105 110
 Phe Ser Ile Arg Phe Ile Ile Leu Phe Ile Leu Leu Ser Thr Phe Leu
 115 120 125
 Ile Leu Leu Pro Arg Ile Thr Trp Gln Leu Ile Tyr Ser Arg Arg Lys
 130 135 140
 Lys Gly Ser Gly Asp Gly Glu His Arg Arg Thr Phe Leu Ile Gly Ala
 145 150 155 160
 Gly Asp Gly Gly Ala Leu Phe Met Asp Ser Tyr Gln His Pro Thr Ser
 165 170 175
 Glu Leu Glu Leu Val Gly Ile Leu Asp Lys Asp Ser Lys Lys Lys Gly
 180 185 190
 Gln Lys Leu Gly Gly Ile Pro Val Leu Gly Ser Tyr Asp Asn Leu Pro
 195 200 205
 Glu Leu Ala Lys Arg His Gln Ile Glu Arg Val Ile Val Ala Ile Pro
 210 215 220
 Ser Leu Asp Pro Ser Glu Tyr Glu Arg Ile Leu Gln Met Cys Asn Lys
 225 230 235 240
 Leu Gly Val Lys Cys Tyr Lys Met Pro Lys Val Glu Thr Val Val Gln
 245 250 255
 Gly Leu His Gln Ala Gly Thr Gly Phe Gln Lys Ile Asp Ile Thr Asp
 260 265 270
 Leu Leu Gly Arg Gln Glu Ile Arg Leu Asp Glu Ser Arg Leu Gly Ala
 275 280 285
 Glu Leu Thr Gly Lys Thr Ile Leu Val Thr Gly Ala Gly Gly Ser Ile
 290 295 300
 Gly Ser Glu Ile Cys Arg Gln Val Ser Arg Phe Asn Pro Glu Arg Ile

305 310 315 320
 Val Leu Leu Gly His Gly Glu Asn Ser Ile Tyr Leu Val Tyr His Glu
 325 330 335
 Leu Ile Arg Lys Phe Gln Gly Ile Asp Tyr Val Pro Val Ile Ala Asp
 340 345 350
 Ile Gln Asp Tyr Asp Arg Leu Leu Gln Val Phe Glu Gln Tyr Lys Pro
 355 360 365
 Ala Ile Val Tyr His Ala Ala Ala His Lys His Val Pro Met Met Glu
 370 375 380
 Arg Asn Pro Lys Glu Ala Phe Lys Asn Asn Ile Arg Gly Thr Tyr Asn
 385 390 395 400
 Val Ala Lys Ala Val Asp Glu Ala Lys Val Ser Lys Met Val Met Ile
 405 410 415
 Ser Thr Asp Lys Ala Val Asn Pro Pro Asn Val Met Gly Ala Thr Lys
 420 425 430
 Arg Val Ala Glu Leu Ile Val Thr Gly Phe Asn Gln Arg Ser Gln Ser
 435 440 445
 Thr Tyr Cys Ala Val Arg Phe Gly Asn Val Leu Gly Ser Arg Gly Ser
 450 455 460
 Val Ile Pro Val Phe Glu Arg Gln Ile Ala Glu Gly Gly Pro Val Thr
 465 470 475 480
 Val Thr Asp Phe Arg Met Thr Arg Tyr Phe Met Thr Ile Pro Glu Ala
 485 490 495
 Ser Arg Leu Val Ile His Ala Gly Ala Tyr Ala Lys Asp Gly Glu Val
 500 505 510
 Phe Ile Leu Asp Met Gly Lys Pro Val Lys Ile Tyr Asp Leu Ala Lys
 515 520 525
 Lys Met Val Leu Leu Ser Gly His Thr Glu Ser Glu Ile Pro Ile Val
 530 535 540
 Glu Val Gly Ile Arg Pro Gly Glu Lys Leu Tyr Glu Glu Leu Leu Val
 545 550 555 560
 Ser Thr Glu Leu Val Asp Asn Gln Val Met Asp Lys Ile Phe Val Gly
 565 570 575
 Lys Val Asn Val Met Pro Leu Glu Ser Ile Asn Gln Lys Ile Gly Glu
 580 585 590
 Phe Arg Thr Leu Ser Gly Asp Glu Leu Lys Gln Ala Ile Ile Ala Phe
 595 600 605
 Ala Asn Gln Thr Thr His Ile Glu

610

615

<210> 105
 <211> 1338
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 105
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 caagttcccg tttcagattt ttgggaaatt ttaggagata atcagtcctgc ttgtattgaa 240
 gatgtgacgc aggagagggc tgtcattcat tatgctgatg gaatgcaggc tcgcttggtt 300
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 tttttgcaag atttggaat agataccagt cagcttatct ttaataactct agcgactcct 600
 ttcttggttt ccttccatca tccagataaa tctggctcgg atgtcttggt atggcaggaa 660
 cctctctatg atgccattcc aggtaatatg cagttgattt tggaaagtga taatgtgcgt 720
 actaagaaga tcatcattcc aaataaggcg acttatgagc gcgctttaga gttaactgac 780
 gagaaatacc atgatcagtt tgtgcacttg ggttatcatt accagttcaa acgtgataat 840
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 atcgaggag ccttgccctga tgctactttc cgtattgcag cggtgacaga gatgtcttct 960
 aagctcttag acatgctttg ctatcctaata gtggcccttt accagaacgc tagtccacag 1020
 aagattcagg agctgtatca actgtcggat atttacttgg atataaacca cagtaatgag 1080
 ttgctacagg cagtgcgtca ggcctttgag cacaatctct tgattcttgg ctttaatcag 1140
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 gctttgggtg agaccattaa attggccctt tcagatgttg atcaaagcg tcaggcactt 1260
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 actgttttag gaggctaa 1338

<210> 106
 <211> 445
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 106
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 35 40 45
 Leu Gly Tyr Glu Asp Gly Lys Pro Leu Tyr Phe Asn Gln Val Pro Val
 50 55 60
 Ser Asp Phe Trp Glu Ile Leu Gly Asp Asn Gln Ser Ala Cys Ile Glu
 65 70 75 80
 Asp Val Thr Gln Glu Arg Ala Val Ile His Tyr Ala Asp Gly Met Gln

85 90 95
 Ala Arg Leu Val Lys Gln Val Asp Trp Lys Asp Leu Glu Gly Arg Val
 100 105 110
 Arg Gln Val Asp His Tyr Asn Arg Phe Gly Ala Cys Phe Ala Thr Thr
 115 120 125
 Thr Tyr Ser Ala Asp Ser Glu Pro Ile Met Thr Val Tyr Gln Asp Val
 130 135 140
 Asn Gly Gln Gln Val Leu Leu Glu Asn His Val Thr Gly Asp Ile Leu
 145 150 155 160
 Leu Thr Leu Pro Gly Gln Ser Met Arg Tyr Phe Ala Asn Lys Val Glu
 165 170 175
 Phe Ile Thr Phe Phe Leu Gln Asp Leu Glu Ile Asp Thr Ser Gln Leu
 180 185 190
 Ile Phe Asn Thr Leu Ala Thr Pro Phe Leu Val Ser Phe His His Pro
 195 200 205
 Asp Lys Ser Gly Ser Asp Val Leu Val Trp Gln Glu Pro Leu Tyr Asp
 210 215 220
 Ala Ile Pro Gly Asn Met Gln Leu Ile Leu Glu Ser Asp Asn Val Arg
 225 230 235 240
 Thr Lys Lys Ile Ile Ile Pro Asn Lys Ala Thr Tyr Glu Arg Ala Leu
 245 250 255
 Glu Leu Thr Asp Glu Lys Tyr His Asp Gln Phe Val His Leu Gly Tyr
 260 265 270
 His Tyr Gln Phe Lys Arg Asp Asn Phe Leu Arg Arg Asp Ala Leu Ile
 275 280 285
 Leu Thr Asn Ser Asp Gln Ile Glu Gln Val Glu Ala Ile Ala Gly Ala
 290 295 300
 Leu Pro Asp Val Thr Phe Arg Ile Ala Ala Val Thr Glu Met Ser Ser
 305 310 315 320
 Lys Leu Leu Asp Met Leu Cys Tyr Pro Asn Val Ala Leu Tyr Gln Asn
 325 330 335
 Ala Ser Pro Gln Lys Ile Gln Glu Leu Tyr Gln Leu Ser Asp Ile Tyr
 340 345 350
 Leu Asp Ile Asn His Ser Asn Glu Leu Leu Gln Ala Val Arg Gln Ala
 355 360 365
 Phe Glu His Asn Leu Leu Ile Leu Gly Phe Asn Gln Thr Val His Asn
 370 375 380
 Arg Leu Tyr Ile Ala Pro Asp His Leu Phe Glu Ser Ser Glu Val Ala

20 25 30
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 35 40 45
 Gln His Leu Thr Ala Asn Ile Gly Phe Asp Asp Asn Gln Val Ile Trp
 50 55 60
 Leu Tyr Asn His Phe Thr Asp Ile Lys Ile Ala Pro Thr Ser Val Thr
 65 70 75 80
 Val Asp Asp Val Leu Ala Tyr Phe Gly Gly Glu Glu Ser His Arg Glu
 85 90 95
 Lys Asn Gly Lys Val Leu Arg Val Phe Phe Phe Asp Gln Asp Lys Phe
 100 105 110
 Val Thr Cys Tyr Leu Val Asp Glu Asn Lys Asp Leu Val Gln His Ala
 115 120 125
 Glu Tyr Val Phe Lys Gly Asn Leu Ile Arg Lys Asp Tyr Phe Ser Tyr
 130 135 140
 Thr Arg Tyr Cys Ser Glu Tyr Phe Ala Pro Lys Asp Asn Val Ala Val
 145 150 155 160
 Leu Tyr Gln Arg Thr Phe Tyr Asn Glu Asp Gly Thr Pro Val Tyr Asp
 165 170 175
 Ile Leu Met Asn Gln Gly Lys Glu Glu Val Tyr His Phe Lys Asp Lys
 180 185 190
 Ile Phe Tyr Gly Lys Gln Ala Phe Val Arg Ala Phe Met Lys Ser Leu
 195 200 205
 Asn Leu Asn Lys Ser Asp Leu Val Ile Leu Asp Arg Glu Thr Gly Ile
 210 215 220
 Gly Gln Val Val Phe Glu Glu Ala Gln Thr Ala His Leu Ala Val Val
 225 230 235 240
 Val His Ala Glu His Tyr Ser Glu Asn Ala Thr Asn Glu Asp Tyr Ile
 245 250 255
 Leu Trp Asn Asn Tyr Tyr Asp Tyr Gln Phe Thr Asn Ala Asp Lys Val
 260 265 270
 Asp Phe Phe Ile Val Ser Thr Asp Arg Gln Asn Glu Val Leu Gln Glu
 275 280 285
 Gln Phe Ala Lys Tyr Thr Gln His Gln Pro Lys Ile Val Thr Ile Pro
 290 295 300
 Val Gly Ser Ile Asp Ser Leu Thr Asp Ser Ser Gln Gly Arg Lys Pro
 305 310 315 320
 Phe Ser Leu Ile Thr Ala Ser Arg Leu Ala Lys Glu Lys His Ile Asp

325 330 335
 Trp Leu Val Lys Ala Val Ile Glu Ala His Lys Glu Leu Pro Glu Leu
 340 345 350
 Thr Phe Asp Ile Tyr Gly Ser Gly Gly Glu Asp Ser Leu Leu Arg Glu
 355 360 365
 Ile Ile Ala Asn His Gln Ala Glu Asp Tyr Ile Gln Leu Lys Gly His
 370 375 380
 Ala Glu Leu Ser Gln Ile Tyr Ser Gln Tyr Glu Val Tyr Leu Thr Ala
 385 390 395 400
 Ser Thr Ser Glu Gly Phe Gly Leu Thr Leu Met Glu Ala Ile Gly Ser
 405 410 415
 Gly Leu Pro Leu Ile Gly Phe Asp Val Pro Tyr Gly Asn Gln Thr Phe
 420 425 430
 Ile Glu Asp Gly Gln Asn Gly Tyr Leu Ile Pro Ser Ser Ser Asp His
 435 440 445
 Val Glu Asp Gln Ile Lys Gln Ala Tyr Ala Ala Lys Ile Cys Gln Leu
 450 455 460
 Tyr Gln Glu Asn Arg Leu Glu Ala Met Arg Ala Tyr Ser Tyr Gln Ile
 465 470 475 480
 Ala Glu Gly Phe Leu Thr Lys Glu Ile Leu Glu Lys Trp Lys Lys Thr
 485 490 495
 Val Glu Glu Val Leu His Asp
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<210> 109
 <211> 2292
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 109
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 gataagcggg ttttagggat gtttccttat gatgttcaag tcatgggagc tattgtcatg 180
 cactatggaa atgttgctga gatgaatacg ggggaaggta agaccttgac agctaccatg 240
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 tatgcttcgg atatcatcta cacaaccaat agtaatttag gttttgatta tctaaatgat 480
 aacctagcct cgaatgaaga aggtaagttt ttacgaccgt ttaactatgt gattattgat 540
 gaaattgatg atatcttgct tgatagtgcg caaactcctc tgattattgc ggggttctcct 600
 cgtgttcagt ctaattacta tgcgatcatt gatacacttg taacaacctt gggtcgaagga 660
 gaggattata tcttttaaaga ggagaaagag gaggtttggc tcactactaa gggggccaag 720
 tctgctgaga atttcctagg gattgataat ttatacaagg aagagcatgc gtcttttgct 780
 cgtcatttgg tttatgcgat tcgagctcat aagctcttta ctaaagataa ggactatatc 840

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gagacgcggg ctatggcctc gatcacctat cagagtcttt ttaagatggt taataagata 1020
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ctacaacagc tatccatggc tatcgggtgt caatctgcta gtcagaaaaa tccaatcgta 2160
gagtactatc aagaagccta cgcgggcttt gaagctatga aagaacagat tcatgcggat 2220
atggtgcgta atctcctgat ggggctggtt gaggtcactc caaaagggtga aatcgtgact 2280
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<210> 110

<211> 763

<212> PRT

<213> Streptococcus pneumoniae

<400> 110

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Arg Gln Arg Leu Ser Glu Gly Glu Ser Leu Asp Asp Ile Leu Val Glu
      20              25              30

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Ala Phe Ala Val Val Arg Glu Ala Asp Lys Arg Ile Leu Gly Met Phe
      35              40              45

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Pro Tyr Asp Val Gln Val Met Gly Ala Ile Val Met His Tyr Gly Asn
      50              55              60

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Val Ala Glu Met Asn Thr Gly Glu Gly Lys Thr Leu Thr Ala Thr Met
      65              70              75              80

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Pro Val Tyr Leu Asn Ala Phe Ser Gly Glu Gly Val Met Val Val Thr
      85              90              95

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Pro Asn Glu Tyr Leu Ser Lys Arg Asp Ala Glu Glu Met Gly Gln Val
      100             105             110

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Tyr Arg Phe Leu Gly Leu Thr Ile Gly Val Pro Phe Thr Glu Asp Pro
      115             120             125

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Lys Lys Glu Met Lys Ala Glu Glu Lys Lys Leu Ile Tyr Ala Ser Asp
 130 135 140
 Ile Ile Tyr Thr Thr Asn Ser Asn Leu Gly Phe Asp Tyr Leu Asn Asp
 145 150 155 160
 Asn Leu Ala Ser Asn Glu Glu Gly Lys Phe Leu Arg Pro Phe Asn Tyr
 165 170 175
 Val Ile Ile Asp Glu Ile Asp Asp Ile Leu Leu Asp Ser Ala Gln Thr
 180 185 190
 Pro Leu Ile Ile Ala Gly Ser Pro Arg Val Gln Ser Asn Tyr Tyr Ala
 195 200 205
 Ile Ile Asp Thr Leu Val Thr Thr Leu Val Glu Gly Glu Asp Tyr Ile
 210 215 220
 Phe Lys Glu Glu Lys Glu Glu Val Trp Leu Thr Thr Lys Gly Ala Lys
 225 230 235 240
 Ser Ala Glu Asn Phe Leu Gly Ile Asp Asn Leu Tyr Lys Glu Glu His
 245 250 255
 Ala Ser Phe Ala Arg His Leu Val Tyr Ala Ile Arg Ala His Lys Leu
 260 265 270
 Phe Thr Lys Asp Lys Asp Tyr Ile Ile Arg Gly Asn Glu Met Val Leu
 275 280 285
 Val Asp Lys Gly Thr Gly Arg Leu Met Glu Met Thr Lys Leu Gln Gly
 290 295 300
 Gly Leu His Gln Ala Ile Glu Ala Lys Glu His Val Lys Leu Ser Pro
 305 310 315 320
 Glu Thr Arg Ala Met Ala Ser Ile Thr Tyr Gln Ser Leu Phe Lys Met
 325 330 335
 Phe Asn Lys Ile Ser Gly Met Thr Gly Thr Gly Lys Val Ala Glu Lys
 340 345 350
 Glu Phe Ile Glu Thr Tyr Asn Met Ser Val Val Arg Ile Pro Thr Asn
 355 360 365
 Arg Pro Arg Gln Arg Ile Asp Tyr Pro Asp Asn Leu Tyr Ile Thr Leu
 370 375 380
 Pro Glu Lys Val Tyr Ala Ser Leu Glu Tyr Ile Lys Gln Tyr His Ala
 385 390 395 400
 Lys Gly Asn Pro Leu Leu Val Phe Val Gly Ser Val Glu Met Ser Gln
 405 410 415
 Leu Tyr Ser Ser Leu Leu Phe Arg Glu Gly Ile Ala His Asn Val Leu
 420 425 430

Asn Ala Asn Asn Ala Ala Arg Glu Ala Gln Ile Ile Ser Glu Ser Gly
 435 440 445
 Gln Met Gly Ala Val Thr Val Ala Thr Ser Met Ala Gly Arg Gly Thr
 450 455 460
 Asp Ile Lys Leu Gly Lys Gly Val Ala Glu Leu Gly Gly Leu Ile Val
 465 470 475 480
 Ile Gly Thr Glu Arg Met Glu Ser Gln Arg Ile Asp Leu Gln Ile Arg
 485 490 495
 Gly Arg Ser Gly Arg Gln Gly Asp Pro Gly Met Ser Lys Phe Phe Val
 500 505 510
 Ser Leu Glu Asp Asp Val Ile Lys Lys Phe Gly Pro Ser Trp Val His
 515 520 525
 Lys Lys Tyr Lys Asp Tyr Gln Val Gln Asp Met Thr Gln Pro Glu Val
 530 535 540
 Leu Lys Gly Arg Lys Tyr Arg Lys Leu Val Glu Lys Ala Gln His Ala
 545 550 555 560
 Ser Asp Ser Ala Gly Arg Ser Ala Arg Arg Gln Thr Leu Glu Tyr Ala
 565 570 575
 Glu Ser Met Asn Ile Gln Arg Asp Ile Val Tyr Lys Glu Arg Asn Arg
 580 585 590
 Leu Ile Asp Gly Ser Arg Asp Leu Glu Asp Val Val Val Asp Ile Ile
 595 600 605
 Glu Arg Tyr Thr Glu Glu Val Ala Ala Asp His Tyr Ala Ser Arg Glu
 610 615 620
 Leu Leu Phe His Phe Ile Val Thr Asn Ile Ser Phe His Val Lys Glu
 625 630 635 640
 Val Pro Asp Tyr Ile Asp Val Thr Asp Lys Thr Ala Val Arg Ser Phe
 645 650 655
 Met Lys Gln Val Ile Asp Lys Glu Leu Ser Glu Lys Lys Glu Leu Leu
 660 665 670
 Asn Gln His Asp Leu Tyr Glu Gln Phe Leu Arg Leu Ser Leu Leu Lys
 675 680 685
 Ala Ile Asp Asp Asn Trp Val Glu Gln Val Asp Tyr Leu Gln Gln Leu
 690 695 700
 Ser Met Ala Ile Gly Gly Gln Ser Ala Ser Gln Lys Asn Pro Ile Val
 705 710 715 720
 Glu Tyr Tyr Gln Glu Ala Tyr Ala Gly Phe Glu Ala Met Lys Glu Gln
 725 730 735

Ile His Ala Asp Met Val Arg Asn Leu Met Gly Leu Val Glu Val
740 745 750

Thr Pro Lys Gly Glu Ile Val Thr His Phe Pro
755 760

<210> 111

<211> 879

<212> DNA

<213> Streptococcus pneumoniae

<400> 111

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ccaattgaaa aaaataactca gttagaggag gaagtctctc aagctgaagt cgaattggaa 180
agccagcaag aagagaaaaat tgaagctcct gaagacagtg aagcgagaac agaaatagaa 240
gaaaagaagg catctaattc tactgaagaa gagccagacc tttctaaaga aacagaaaaa 300
gtcactatag ctgaagagag ccaagaagct cttcctcagc aaaaagcaac cacgaaagag 360
ccacttctta tcagtaaattc tttagaaagt ccttatatcc ccgaccaagc tccaaaatct 420
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tctcctacaa gtaagttgga aacaagtatc acacacagtt acacagcctt tctcttgctc 540
attctgtttt ctgcatcttc ctttttcttt agtatctatc acatcaaaca tgcttactat 600
ggacatatag caagcattaa cagtcgcttc cctgagcagc tagctccttt aactcttttt 660
tctatcatct ctatcctagt agcgacaaca ctcttcttct tttcattcct cttgggtagt 720
ttcgttgtga gacgatttat ccaccaggaa aaggactgga cgctagacaa ggttctccaa 780
caatatagtc aactcttggc aattccaatc tcctcactgc tattgctagt ttctttgctt 840
tctttgatag cctacgattt acagccctct tgtgtgtga 879
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<210> 112

<211> 292

<212> PRT

<213> Streptococcus pneumoniae

<400> 112

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20 25 30

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35 40 45

Glu Glu Glu Val Ser Gln Ala Glu Val Glu Leu Glu Ser Gln Gln Glu
50 55 60

Glu Lys Ile Glu Ala Pro Glu Asp Ser Glu Ala Arg Thr Glu Ile Glu
65 70 75 80

Glu Lys Lys Ala Ser Asn Ser Thr Glu Glu Glu Pro Asp Leu Ser Lys
85 90 95

Glu Thr Glu Lys Val Thr Ile Ala Glu Glu Ser Gln Glu Ala Leu Pro
100 105 110

Gln Gln Lys Ala Thr Thr Lys Glu Pro Leu Leu Ile Ser Lys Ser Leu
 115 120 125
 Glu Ser Pro Tyr Ile Pro Asp Gln Ala Pro Lys Ser Arg Asp Lys Trp
 130 135 140
 Lys Glu Gln Val Leu Asp Phe Trp Ser Trp Leu Val Glu Ala Ile Lys
 145 150 155 160
 Ser Pro Thr Ser Lys Leu Glu Thr Ser Ile Thr His Ser Tyr Thr Ala
 165 170 175
 Phe Leu Leu Leu Ile Leu Phe Ser Ala Ser Ser Phe Phe Phe Ser Ile
 180 185 190
 Tyr His Ile Lys His Ala Tyr Tyr Gly His Ile Ala Ser Ile Asn Ser
 195 200 205
 Arg Phe Pro Glu Gln Leu Ala Pro Leu Thr Leu Phe Ser Ile Ile Ser
 210 215 220
 Ile Leu Val Ala Thr Thr Leu Phe Phe Phe Ser Phe Leu Leu Gly Ser
 225 230 235 240
 Phe Val Val Arg Arg Phe Ile His Gln Glu Lys Asp Trp Thr Leu Asp
 245 250 255
 Lys Val Leu Gln Gln Tyr Ser Gln Leu Leu Ala Ile Pro Ile Ser Ser
 260 265 270
 Leu Leu Leu Leu Val Ser Leu Leu Ser Leu Ile Ala Tyr Asp Leu Gln
 275 280 285
 Pro Ser Cys Val
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<210> 113
 <211> 327
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 113
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 tccacactct atccattct caaaaaattg gaaggcaata gctttctgac aacctattct 180
 agagagttcc aaggctcgc atgcgaaatac tactccttga caaacggtgg tatagagcag 240
 ctcttgaccc taaaagatga atgggcactc tatacagaca ccatcaatgg catcatagaa 300
 gggagtatcc gccatgacaa gaactga 327

<210> 114
 <211> 108
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 114
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35 40 45
Lys Leu Glu Gly Asn Ser Phe Leu Thr Thr Tyr Ser Arg Glu Phe Gln
50 55 60
Gly Arg Met Arg Lys Tyr Tyr Ser Leu Thr Asn Gly Gly Ile Glu Gln
65 70 75 80
Leu Leu Thr Leu Lys Asp Glu Trp Ala Leu Tyr Thr Asp Thr Ile Asn
85 90 95
Gly Ile Ile Glu Gly Ser Ile Arg His Asp Lys Asn
100 105

<210> 115
<211> 954
<212> DNA
<213> Streptococcus pneumoniae

<400> 115
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gatggtgaaa ctgagctaaa ccaggtcaaa gacaacaatc aggccttaa gcgttttagca 180
ctacgcaaag aagaatggct caagacctac cagtttctct tgatgaaggc tgggcaaaca 240
gaacccttgc aggccaatca ccagtttaca ccggatgcta ttgctttgct tttggtgttt 300
attgtggaag agttgtttta agaggaggaa attactatcc tcgaaatggg ttctgggatg 360
ggaattctag gcgctatttt cttgacctcg cttactaaaa aggtggatta cttgggaatg 420
gaagtggatg atttgctgat tgatctggca gctagcatgg cagatgtaat tggtttgcag 480
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ctcaagtcag acggatacgc tatttttcta gctccgagtg atttgttgac cagtcctcaa 720
agtgatttgt taaaagaatg gctgaaagaa gaggcgagtc tggttgctat gattagtctg 780
cctgaaaatc tctttgctaa tgccaaacaa tctaagacta tttttatctt acagaagaaa 840
aatgaaatag cagtagagcc ttttgtttat ccacttgcta gcttgcaaga tgcaagtgtt 900
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<210> 116
<211> 317
<212> PRT
<213> Streptococcus pneumoniae

<400> 116
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 Val Glu Gln Asn Ser Ile Tyr Leu Asp Gly Glu Thr Glu Leu Asn Gln
 35 40 45
 Val Lys Asp Asn Asn Gln Ala Leu Lys Arg Leu Ala Leu Arg Lys Glu
 50 55 60
 Glu Trp Leu Lys Thr Tyr Gln Phe Leu Leu Met Lys Ala Gly Gln Thr
 65 70 75 80
 Glu Pro Leu Gln Ala Asn His Gln Phe Thr Pro Asp Ala Ile Ala Leu
 85 90 95
 Leu Leu Val Phe Ile Val Glu Glu Leu Phe Lys Glu Glu Glu Ile Thr
 100 105 110
 Ile Leu Glu Met Gly Ser Gly Met Gly Ile Leu Gly Ala Ile Phe Leu
 115 120 125
 Thr Ser Leu Thr Lys Lys Val Asp Tyr Leu Gly Met Glu Val Asp Asp
 130 135 140
 Leu Leu Ile Asp Leu Ala Ala Ser Met Ala Asp Val Ile Gly Leu Gln
 145 150 155 160
 Ala Gly Phe Val Gln Gly Asp Ala Val Arg Pro Gln Met Leu Lys Glu
 165 170 175
 Ser Asp Val Val Ile Ser Asp Leu Pro Val Gly Tyr Tyr Pro Asp Asp
 180 185 190
 Ala Val Ala Ser Arg His Gln Val Ala Ser Ser Gln Glu His Thr Tyr
 195 200 205
 Ala His His Leu Leu Met Glu Gln Gly Leu Lys Tyr Leu Lys Ser Asp
 210 215 220
 Gly Tyr Ala Ile Phe Leu Ala Pro Ser Asp Leu Leu Thr Ser Pro Gln
 225 230 235 240
 Ser Asp Leu Leu Lys Glu Trp Leu Lys Glu Glu Ala Ser Leu Val Ala
 245 250 255
 Met Ile Ser Leu Pro Glu Asn Leu Phe Ala Asn Ala Lys Gln Ser Lys
 260 265 270
 Thr Ile Phe Ile Leu Gln Lys Lys Asn Glu Ile Ala Val Glu Pro Phe
 275 280 285
 Val Tyr Pro Leu Ala Ser Leu Gln Asp Ala Ser Val Leu Met Lys Phe
 290 295 300
 Lys Glu Asn Phe Gln Lys Trp Thr Gln Gly Thr Glu Ile
 305 310 315

<210> 117
 <211> 1902
 <212> DNA
 <213> Streptococcus pneumoniae

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<400> 117
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<210> 118
 <211> 633
 <212> PRT
 <213> Streptococcus pneumoniae

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      20             25             30

Ala Leu Val Gly Lys Asn Gly Ala Gly Lys Ser Thr Leu Leu Lys Ile
      35             40             45

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 Asn Thr Ile Tyr Asp Glu Met Leu His Val Phe Asn Asp Leu Arg Arg
 85 90 95
 Thr Glu Arg Gln Leu Arg Gln Met Glu Leu Glu Met Gly Glu Lys Ser
 100 105 110
 Gly Glu Asp Leu Asp Lys Leu Met Ser Asp Tyr Asp Arg Leu Ser Glu
 115 120 125
 Asn Phe Arg Gln Ala Gly Gly Phe Thr Tyr Glu Ala Asp Ile Arg Ala
 130 135 140
 Ile Leu Asn Gly Phe Lys Phe Asp Glu Ser Met Trp Gln Met Lys Ile
 145 150 155 160
 Ala Glu Leu Ser Gly Gly Gln Asn Thr Arg Leu Ala Leu Ala Lys Met
 165 170 175
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 180 185 190
 Leu Asp Ile Glu Thr Ile Ala Trp Leu Glu Asn Tyr Leu Val Asn Tyr
 195 200 205
 Ser Gly Ala Leu Ile Ile Val Ser His Asp Arg Tyr Phe Leu Asp Lys
 210 215 220
 Val Ala Thr Ile Thr Leu Asp Leu Thr Lys His Ser Leu Asp Arg Tyr
 225 230 235 240
 Val Gly Asn Tyr Ser Arg Phe Val Glu Leu Lys Glu Gln Lys Leu Val
 245 250 255
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 Glu Asp Phe Val Asn Arg Asn Leu Val Arg Ala Ser Thr Thr Lys Arg
 275 280 285
 Ala Gln Ser Arg Arg Lys Gln Leu Glu Lys Met Glu Arg Leu Asp Lys
 290 295 300
 Pro Glu Ala Gly Lys Lys Ala Ala Asn Met Thr Phe Gln Ser Glu Lys
 305 310 315 320
 Thr Ser Gly Asn Val Val Leu Thr Val Glu Asn Ala Ala Val Gly Tyr
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 Asp Gly Glu Val Leu Ser Gln Pro Ile Asn Leu Asp Leu Arg Lys Met
 340 345 350

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 Phe Gly Ala Asn Val Glu Val Gly Tyr Tyr Asp Gln Thr Gln Ser Lys
 385 390 395 400
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 405 410 415
 Leu Thr Pro Glu Val Glu Ile Arg Asn Arg Leu Gly Ala Phe Leu Phe
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 Ser Gly Asp Asp Val Lys Lys Ser Val Gly Met Leu Ser Gly Gly Glu
 435 440 445
 Lys Ala Arg Leu Leu Leu Ala Lys Leu Ser Met Glu Asn Asn Asn Phe
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 Leu Ile Leu Asp Glu Pro Thr Asn His Leu Asp Ile Asp Ser Lys Glu
 465 470 475 480
 Val Leu Glu Asn Ala Leu Ile Asp Phe Asp Gly Thr Leu Leu Phe Val
 485 490 495
 Ser His Asp Arg Tyr Phe Ile Asn Arg Val Ala Thr His Val Leu Glu
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 Leu Ser Glu Asn Gly Ser Thr Leu Tyr Leu Gly Asp Tyr Asp Tyr Tyr
 515 520 525
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 530 535 540
 Thr Ser Asn Gln Ala Lys Glu Ala Ser Pro Val Asn Asp Tyr Gln Ala
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 Gln Lys Glu Ser Gln Lys Glu Val Arg Lys Leu Met Arg Gln Ile Glu
 565 570 575
 Ser Leu Glu Ala Glu Ile Glu Glu Leu Glu Ser Gln Ser Gln Ala Ile
 580 585 590
 Ser Glu Gln Met Leu Glu Thr Asn Asp Ala Asp Lys Leu Met Glu Leu
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 Gln Ala Glu Leu Asp Lys Ile Ser His Arg Gln Glu Glu Ala Met Leu
 610 615 620
 Glu Trp Glu Glu Leu Ser Glu Gln Val
 625 630

<210> 119
 <211> 1179
 <212> DNA
 <213> Streptococcus pneumoniae

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<210> 120
 <211> 392
 <212> PRT
 <213> Streptococcus pneumoniae

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 50 55 60
 Arg Phe Ser Arg Arg Lys Ile Leu Met Thr Ala Asp Leu Val Cys Gly
 65 70 75 80
 Ile Leu Cys Leu Ala Ile Ser Phe Ile Arg Asn Asp Ser Trp Met Ile
 85 90 95
 Gly Ala Leu Ile Val Ala Asn Ile Val Gln Ala Ile Ala Phe Ala Phe
 100 105 110
 Ser Arg Thr Ala Asn Lys Ala Ile Ile Thr Glu Val Val Glu Lys Asp
 115 120 125

Glu Ile Val Ile Tyr Asn Ser Arg Leu Glu Leu Val Leu Gln Val Val
 130 135 140
 Gly Val Ser Ser Pro Val Leu Ser Phe Leu Val Leu Gln Phe Ala Ser
 145 150 155 160
 Leu His Met Thr Leu Leu Asp Ser Leu Thr Phe Phe Ile Ala Phe
 165 170 175
 Val Leu Val Ala Phe Leu Pro Lys Glu Glu Ala Lys Val Gln Glu Lys
 180 185 190
 Lys Ala Phe Thr Gly Arg Asp Ile Phe Val Asp Ile Lys Asp Gly Leu
 195 200 205
 His Tyr Ile Trp His Gln Gln Glu Ile Phe Phe Leu Leu Leu Val Ala
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 Ser Ser Val Asn Phe Phe Phe Ala Ala Phe Glu Phe Leu Leu Pro Phe
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 Lys Ala Asn Ile Tyr Asn Leu Leu Ile Leu Leu Ala Leu Thr Gly Val
 275 280 285
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 290 295 300
 Gly Asn Leu Val Cys Glu Leu Phe Met Thr Ile Phe Asn Ile His Phe
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 Phe Thr Gln Val Gln Thr Lys Val Glu Ser Glu Phe Leu Gly Arg Val
 325 330 335
 Leu Ser Thr Ile Phe Thr Leu Ala Ile Leu Phe Met Pro Ile Ala Lys
 340 345 350
 Gly Phe Met Thr Val Leu Pro Ser Val His Leu Tyr Ser Phe Leu Ile
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<210> 121
 <211> 2466
 <212> DNA

<213> Streptococcus pneumoniae

<400> 121

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<210> 122

<211> 821

<212> PRT

<213> Streptococcus pneumoniae

<400> 122

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Gln Gln Lys Gln Lys Asn Lys Lys Ser Ala Arg Pro Gly Lys Lys Gly

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. . .

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| Ala Ile Leu Leu Ser Ile Lys Ala Leu Phe Asn Leu Leu Phe Val Leu 50 55 60 | | |
| Gly Phe Leu Gly Gly Met Leu Gly Ala Gly Ile Ala Leu Gly Tyr Gly 65 70 75 80 | | |
| Val Ala Leu Phe Asp Lys Val Arg Val Pro Gln Thr Glu Glu Leu Val 85 90 95 | | |
| Asn Gln Val Lys Asp Ile Ser Ser Ile Ser Glu Ile Thr Tyr Ser Asp 100 105 110 | | |
| Gly Thr Val Ile Ala Ser Ile Glu Ser Asp Leu Leu Arg Thr Ser Ile 115 120 125 | | |
| Ser Ser Glu Gln Ile Ser Glu Asn Leu Lys Lys Ala Ile Ile Ala Thr 130 135 140 | | |
| Glu Asp Glu His Phe Lys Glu His Lys Gly Val Val Pro Lys Ala Val 145 150 155 160 | | |
| Ile Arg Ala Thr Leu Gly Lys Phe Val Gly Leu Gly Ser Ser Ser Gly 165 170 175 | | |
| Gly Ser Thr Leu Thr Gln Gln Leu Ile Lys Gln Gln Val Val Gly Asp 180 185 190 | | |
| Ala Pro Thr Leu Ala Arg Lys Ala Ala Glu Ile Val Asp Ala Leu Ala 195 200 205 | | |
| Leu Glu Arg Ala Met Asn Lys Asp Glu Ile Leu Thr Thr Tyr Leu Asn 210 215 220 | | |
| Val Ala Pro Phe Gly Arg Asn Asn Lys Gly Gln Asn Ile Ala Gly Ala 225 230 235 240 | | |
| Arg Gln Ala Ala Glu Gly Ile Phe Gly Val Asp Ala Ser Gln Leu Thr 245 250 255 | | |
| Val Pro Gln Ala Ala Phe Leu Ala Gly Leu Pro Gln Ser Pro Ile Thr 260 265 270 | | |
| Tyr Ser Pro Tyr Glu Asn Thr Gly Glu Leu Lys Ser Asp Glu Asp Leu 275 280 285 | | |
| Glu Ile Gly Leu Arg Arg Ala Lys Ala Val Leu Tyr Ser Met Tyr Arg 290 295 300 | | |
| Thr Gly Ala Leu Ser Lys Asp Glu Tyr Ser Gln Tyr Lys Asp Tyr Asp 305 310 315 320 | | |
| Leu Lys Gln Asp Phe Leu Pro Ser Gly Thr Val Thr Gly Ile Ser Arg | | |

| | | |
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| Asp Tyr Leu Tyr Phe Thr Thr Leu Ala Glu Ala Gln Glu Arg Met Tyr | | |
| 340 | 345 | 350 |
| Asp Tyr Leu Ala Gln Arg Asp Asn Val Ser Ala Lys Glu Leu Lys Asn | | |
| 355 | 360 | 365 |
| Glu Ala Thr Gln Lys Phe Tyr Arg Asp Leu Ala Ala Lys Glu Ile Glu | | |
| 370 | 375 | 380 |
| Asn Gly Gly Tyr Lys Ile Thr Thr Thr Ile Asp Gln Lys Ile His Ser | | |
| 385 | 390 | 395 |
| Ala Met Gln Ser Ala Val Ala Asp Tyr Gly Tyr Leu Leu Asp Asp Gly | | |
| 405 | 410 | 415 |
| Thr Gly Arg Val Glu Val Gly Asn Val Leu Met Asp Asn Gln Thr Gly | | |
| 420 | 425 | 430 |
| Ala Ile Leu Gly Phe Val Gly Gly Arg Asn Tyr Gln Glu Asn Gln Asn | | |
| 435 | 440 | 445 |
| Asn His Ala Phe Asp Thr Lys Arg Ser Pro Ala Ser Thr Thr Lys Pro | | |
| 450 | 455 | 460 |
| Leu Leu Ala Tyr Gly Ile Ala Ile Asp Gln Gly Leu Met Gly Ser Glu | | |
| 465 | 470 | 475 |
| Thr Ile Leu Ser Asn Tyr Pro Thr Asn Phe Ala Asn Gly Asn Pro Ile | | |
| 485 | 490 | 495 |
| Met Tyr Ala Asn Ser Lys Gly Thr Gly Met Met Thr Leu Gly Glu Ala | | |
| 500 | 505 | 510 |
| Leu Asn Tyr Ser Trp Asn Ile Pro Ala Tyr Trp Thr Tyr Arg Met Leu | | |
| 515 | 520 | 525 |
| Arg Glu Lys Gly Val Asp Val Lys Gly Tyr Met Glu Lys Met Gly Tyr | | |
| 530 | 535 | 540 |
| Glu Ile Pro Glu Tyr Gly Ile Glu Ser Leu Pro Met Gly Gly Gly Ile | | |
| 545 | 550 | 555 |
| Glu Val Thr Val Ala Gln His Thr Asn Gly Tyr Gln Thr Leu Ala Asn | | |
| 565 | 570 | 575 |
| Asn Gly Val Tyr His Gln Lys His Val Ile Ser Lys Ile Glu Ala Ala | | |
| 580 | 585 | 590 |
| Asp Gly Arg Val Val Tyr Glu Tyr Gln Asp Lys Pro Val Gln Val Tyr | | |
| 595 | 600 | 605 |
| Ser Lys Ala Thr Ala Thr Ile Met Gln Gly Leu Leu Arg Glu Val Leu | | |
| 610 | 615 | 620 |
| Ser Ser Arg Val Thr Thr Thr Phe Lys Ser Asn Leu Thr Ser Leu Asn | | |

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 645 650 655
 Gln Asp Glu Asn Met Trp Leu Met Leu Ser Thr Pro Arg Leu Thr Leu
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 Gly Gly Trp Ile Gly His Asp Asp Asn His Ser Leu Ser Arg Arg Ala
 675 680 685
 Gly Tyr Ser Asn Asn Ser Asn Tyr Met Ala His Leu Val Asn Ala Ile
 690 695 700
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 740 745 750
 Val Thr Ser Tyr Trp Ala Asn Lys Ser Gly Ala Pro Ala Thr Ser Tyr
 755 760 765
 Arg Phe Ala Ile Gly Gly Ser Asp Ala Asp Tyr Gln Asn Ala Trp Ser
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 Ser Ile Val Gly Ser Leu Pro Thr Pro Ser Ser Ser Ser Ser Ser
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<210> 123

<211> 1974

<212> DNA

<213> Streptococcus pneumoniae

<400> 123

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<210> 124

<211> 657

<212> PRT

<213> Streptococcus pneumoniae

<400> 124

```

Met Lys Lys Phe Tyr Val Ser Pro Ile Phe Pro Ile Leu Val Gly Leu
  1             5             10             15

```

```

Ile Ala Phe Gly Val Leu Ser Thr Phe Ile Ile Phe Val Asn Asn Asn
          20             25             30

```

```

Leu Leu Thr Val Leu Ile Leu Phe Leu Phe Val Gly Gly Tyr Val Phe
  35             40             45

```

```

Leu Phe Lys Lys Leu Arg Val His Tyr Thr Arg Ser Asp Val Glu Gln
  50             55             60

```

```

Ile Gln Tyr Val Asn His Gln Ala Glu Glu Ser Leu Thr Ala Leu Leu
  65             70             75             80

```

```

Glu Gln Met Pro Val Gly Val Met Lys Leu Asn Leu Ser Ser Gly Glu
          85             90             95

```

```

Val Glu Trp Phe Asn Pro Tyr Ala Glu Leu Ile Leu Thr Lys Glu Asp
      100             105             110

```

```

Gly Asp Phe Asp Leu Glu Ala Val Gln Thr Ile Ile Lys Ala Ser Val
      115             120             125

```

```

Gly Asn Pro Ser Thr Tyr Ala Lys Leu Gly Glu Lys Arg Tyr Ala Val
      130             135             140

```

His Met Asp Ala Ser Ser Gly Val Leu Tyr Phe Val Asp Val Ser Arg
 145 150 155 160
 Glu Gln Ala Ile Thr Asp Glu Leu Val Thr Ser Arg Pro Val Ile Gly
 165 170 175
 Ile Val Ser Val Asp Asn Tyr Asp Asp Leu Glu Asp Glu Thr Ser Glu
 180 185 190
 Ser Asp Ile Ser Gln Ile Asn Ser Phe Val Ala Asn Phe Ile Ser Glu
 195 200 205
 Phe Ser Glu Lys His Met Met Phe Ser Arg Arg Val Ser Met Asp Arg
 210 215 220
 Phe Tyr Leu Phe Thr Asp Tyr Thr Val Leu Glu Gly Leu Met Asn Asp
 225 230 235 240
 Lys Phe Ser Val Ile Asp Ala Phe Arg Glu Glu Ser Lys Gln Arg Gln
 245 250 255
 Leu Pro Leu Thr Leu Ser Met Gly Phe Ser Tyr Gly Asp Gly Asn His
 260 265 270
 Asp Glu Ile Gly Lys Val Ala Leu Leu Asn Leu Asn Leu Ala Glu Val
 275 280 285
 Arg Gly Gly Asp Gln Val Val Val Lys Glu Asn Asp Glu Thr Lys Asn
 290 295 300
 Pro Val Tyr Phe Gly Gly Gly Ser Ala Ala Ser Ile Lys Arg Thr Arg
 305 310 315 320
 Thr Arg Thr Arg Ala Met Met Thr Ala Ile Ser Asp Lys Ile Arg Ser
 325 330 335
 Val Asp Gln Val Phe Val Val Gly His Lys Asn Leu Asp Met Asp Ala
 340 345 350
 Leu Gly Ser Ala Val Gly Met Gln Leu Phe Ala Ser Asn Val Ile Glu
 355 360 365
 Asn Ser Tyr Ala Leu Tyr Asp Glu Glu Gln Met Ser Pro Asp Ile Glu
 370 375 380
 Arg Ala Val Ser Phe Ile Glu Lys Glu Gly Val Thr Lys Leu Leu Ser
 385 390 395 400
 Val Lys Asp Ala Met Gly Met Val Thr Asn Arg Ser Leu Leu Ile Leu
 405 410 415
 Val Asp His Ser Lys Thr Ala Leu Thr Leu Ser Lys Glu Phe Tyr Asp
 420 425 430
 Leu Phe Thr Gln Thr Ile Val Ile Asp His His Arg Arg Asp Gln Asp
 435 440 445

Phe Pro Asp Asn Ala Val Ile Thr Tyr Ile Glu Ser Gly Ala Ser Ser
 450 455 460
 Ala Ser Glu Leu Val Thr Glu Leu Ile Gln Phe Gln Asn Ser Lys Lys
 465 470 475 480
 Asn Arg Leu Ser Arg Met Gln Ala Ser Val Leu Met Ala Gly Met Met
 485 490 495
 Leu Asp Thr Lys Asn Phe Thr Ser Arg Val Thr Ser Arg Thr Phe Asp
 500 505 510
 Val Ala Ser Tyr Leu Arg Thr Arg Gly Ser Asp Ser Ile Ala Ile Gln
 515 520 525
 Glu Ile Ala Ala Thr Asp Phe Glu Glu Tyr Arg Glu Val Asn Glu Leu
 530 535 540
 Ile Leu Gln Gly Arg Lys Leu Gly Ser Asp Val Leu Ile Ala Glu Ala
 545 550 555 560
 Lys Asp Met Lys Cys Tyr Asp Thr Val Val Ile Ser Lys Ala Ala Asp
 565 570 575
 Ala Met Leu Ala Met Ser Gly Ile Glu Ala Ser Phe Val Leu Ala Lys
 580 585 590
 Asn Thr Gln Gly Phe Ile Ser Ile Ser Ala Arg Ser Arg Ser Lys Leu
 595 600 605
 Asn Val Gln Arg Ile Met Glu Glu Leu Gly Gly Gly Gly His Phe Asn
 610 615 620
 Leu Ala Ala Ala Gln Ile Lys Asp Val Thr Leu Ser Glu Ala Gly Glu
 625 630 635 640
 Lys Leu Thr Glu Ile Val Leu Asn Glu Met Lys Glu Lys Glu Lys Glu
 645 650 655
 Glu

<210> 125

<211> 663

<212> DNA

<213> Streptococcus pneumoniae

<400> 125

atgaagtgct tggtatgtgg gcagactatg aagactgttt taacttttag tagtctctta 60
 cttctgagga atgatgactc ttgtctttgt tcagactgtg attctacttt tgaaagaatt 120
 ggggaagaga actgtccaaa ttgtatgaaa acagagttgt caacaaagtg tcaagattgt 180
 caacttttgt gtaaagaggg agttgaagtc agtcatagag cgatttttac ttacaatcaa 240
 gctatgaagg attttttcag tcggtataag tttgatggag acttcctgtt aagaaaagtt 300
 ttcgcttcat ttttaagtga ggagttgaaa aagtacaaag agtatcaatt tgttgtaatt 360
 cccctaagtc ctgatagata tgctaataga ggatttaatc aggttgaggg cttggtagag 420

gcagcaggct ttgagtatct ggatttatta gagaaaagag aagagagagc cagttcttct 480
 aaaaatcggt cagagcgctt ggggacagaa cttcctttct ttattaaaag tggagtcact 540
 attcctaaaa aaatcctact tatagatgat atctatacta caggagcaac tataaatcgt 600
 gttaagaaac tgttggaaga agctggtgct aaggatgtaa aaacattttc ccttgtaaga 660
 tga 663

<210> 126

<211> 220

<212> PRT

<213> Streptococcus pneumoniae

<400> 126

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Lys | Cys | Leu | Leu | Cys | Gly | Gln | Thr | Met | Lys | Thr | Val | Leu | Thr | Phe |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | |
| Ser | Ser | Leu | Leu | Leu | Leu | Arg | Asn | Asp | Asp | Ser | Cys | Leu | Cys | Ser | Asp |
| | | 20 | | | | | | 25 | | | | | 30 | | |
| Cys | Asp | Ser | Thr | Phe | Glu | Arg | Ile | Gly | Glu | Glu | Asn | Cys | Pro | Asn | Cys |
| | 35 | | | | | | 40 | | | | | 45 | | | |
| Met | Lys | Thr | Glu | Leu | Ser | Thr | Lys | Cys | Gln | Asp | Cys | Gln | Leu | Trp | Cys |
| | 50 | | | | | 55 | | | | | 60 | | | | |
| Lys | Glu | Gly | Val | Glu | Val | Ser | His | Arg | Ala | Ile | Phe | Thr | Tyr | Asn | Gln |
| 65 | | | | | 70 | | | | | 75 | | | | | 80 |
| Ala | Met | Lys | Asp | Phe | Phe | Ser | Arg | Tyr | Lys | Phe | Asp | Gly | Asp | Phe | Leu |
| | | | | 85 | | | | | 90 | | | | | 95 | |
| Leu | Arg | Lys | Val | Phe | Ala | Ser | Phe | Leu | Ser | Glu | Glu | Leu | Lys | Lys | Tyr |
| | | 100 | | | | | | 105 | | | | | 110 | | |
| Lys | Glu | Tyr | Gln | Phe | Val | Val | Ile | Pro | Leu | Ser | Pro | Asp | Arg | Tyr | Ala |
| | 115 | | | | | | 120 | | | | | 125 | | | |
| Asn | Arg | Gly | Phe | Asn | Gln | Val | Glu | Gly | Leu | Val | Glu | Ala | Ala | Gly | Phe |
| | 130 | | | | | 135 | | | | | 140 | | | | |
| Glu | Tyr | Leu | Asp | Leu | Leu | Glu | Lys | Arg | Glu | Glu | Arg | Ala | Ser | Ser | Ser |
| 145 | | | | | 150 | | | | | 155 | | | | | 160 |
| Lys | Asn | Arg | Ser | Glu | Arg | Leu | Gly | Thr | Glu | Leu | Pro | Phe | Phe | Ile | Lys |
| | | | | 165 | | | | | 170 | | | | | 175 | |
| Ser | Gly | Val | Thr | Ile | Pro | Lys | Lys | Ile | Leu | Leu | Ile | Asp | Asp | Ile | Tyr |
| | | 180 | | | | | | 185 | | | | | 190 | | |
| Thr | Thr | Gly | Ala | Thr | Ile | Asn | Arg | Val | Lys | Lys | Leu | Leu | Glu | Glu | Ala |
| | | 195 | | | | | 200 | | | | | 205 | | | |
| Gly | Ala | Lys | Asp | Val | Lys | Thr | Phe | Ser | Leu | Val | Arg | | | | |
| | 210 | | | | | 215 | | | | | 220 | | | | |

<210> 127
 <211> 1299
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 127
 atgaaagtaa atttagatta tctcgggtcgt ttattttactg agaatgaatt aacagaagaa 60
 gaacgtcagt tggcggagaa acttccagca atgagaaagg agaaggggaa acttttctgt 120
 caacgctgta atagtactat tctagaagaa tggatattgc ccatcgggtgc ttactattgt 180
 cgagagtgtc tgctgatgaa gcgagtcaga agtgatcaaa ctttatacta ttttccgcag 240
 gaggattttc caaagcaaga tgttctcaaa tggcgcggcc aattaactcc ttttcaagag 300
 aagggtgtcag agggattgct tcaagtagta gacaagcaaa agccaacctt agttcatgcg 360
 gtaacaggag ctggaaaagac agaaatgatt tatcaagtag tggctaaagt gatcaatgcg 420
 ggtggtgcag tgtgtttggc tagtcctcgc atagatgttt gtttggagct gtacaagcgc 480
 ctgcaacagg atttttcttg cgggatagct ttgctacatg gagaatcgga accttatttt 540
 cgaacaccac tagttgttgc aacaacccat cagttattga agttttatca agcttttgat 600
 ttgctgatag tggatgaagt agatgctttt ctttatgttg ataatcccat gctttaccac 660
 gctgtcaaga atagtgtaaa ggagaatgga ttgagaatct ttttaacagc gacttcgacc 720
 aatgagttag ataaaaaggc ccgttttaga gaactaaaaa gactgaattt accgagacgg 780
 tttcatggaa atccgttgat tattccaaaa ccaatttggt tatcggattt taatcgctac 840
 ttagacaaga atcgtttgtc accaaagtta aagtcctata ttgagaagca gagaaaagaca 900
 gcttatccgt tactcatttt tgcttcagaa attaagaaag gggagcagtt agcagaaatc 960
 ttacaggagc aatttccaaa tgagaaaatt ggctttgtat cttctgtaac agaggatcga 1020
 ttagagcaag tacaagcttt tcgagatgga gaactgacaa tacttatcag tacgacaatc 1080
 ttggagcgcg gagttacctt cccttggtgtg gatgttttcg tagtagaggc caatcatcgt 1140
 ttgtttacca agtctagttt gattcagatt ggtggacgag ttggacgaag catggataga 1200
 ccgacaggag atttgctttt cttccatgat gggttaaatg cttcaatcaa gaaggcgatt 1260
 aaggaaattc agatgatgaa taaggaggct ggtctatga 1299

<210> 128
 <211> 432
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 128
 Met Lys Val Asn Leu Asp Tyr Leu Gly Arg Leu Phe Thr Glu Asn Glu
 1 5 10 15
 Leu Thr Glu Glu Glu Arg Gln Leu Ala Glu Lys Leu Pro Ala Met Arg
 20 25 30
 Lys Glu Lys Gly Lys Leu Phe Cys Gln Arg Cys Asn Ser Thr Ile Leu
 35 40 45
 Glu Glu Trp Tyr Leu Pro Ile Gly Ala Tyr Tyr Cys Arg Glu Cys Leu
 50 55 60
 Leu Met Lys Arg Val Arg Ser Asp Gln Thr Leu Tyr Tyr Phe Pro Gln
 65 70 75 80
 Glu Asp Phe Pro Lys Gln Asp Val Leu Lys Trp Arg Gly Gln Leu Thr
 85 90 95
 Pro Phe Gln Glu Lys Val Ser Glu Gly Leu Leu Gln Val Val Asp Lys
 100 105 110

Gln Lys Pro Thr Leu Val His Ala Val Thr Gly Ala Gly Lys Thr Glu
 115 120 125
 Met Ile Tyr Gln Val Val Ala Lys Val Ile Asn Ala Gly Gly Ala Val
 130 135 140
 Cys Leu Ala Ser Pro Arg Ile Asp Val Cys Leu Glu Leu Tyr Lys Arg
 145 150 155 160
 Leu Gln Gln Asp Phe Ser Cys Gly Ile Ala Leu Leu His Gly Glu Ser
 165 170 175
 Glu Pro Tyr Phe Arg Thr Pro Leu Val Val Ala Thr Thr His Gln Leu
 180 185 190
 Leu Lys Phe Tyr Gln Ala Phe Asp Leu Leu Ile Val Asp Glu Val Asp
 195 200 205
 Ala Phe Pro Tyr Val Asp Asn Pro Met Leu Tyr His Ala Val Lys Asn
 210 215 220
 Ser Val Lys Glu Asn Gly Leu Arg Ile Phe Leu Thr Ala Thr Ser Thr
 225 230 235 240
 Asn Glu Leu Asp Lys Lys Val Arg Leu Gly Glu Leu Lys Arg Leu Asn
 245 250 255
 Leu Pro Arg Arg Phe His Gly Asn Pro Leu Ile Ile Pro Lys Pro Ile
 260 265 270
 Trp Leu Ser Asp Phe Asn Arg Tyr Leu Asp Lys Asn Arg Leu Ser Pro
 275 280 285
 Lys Leu Lys Ser Tyr Ile Glu Lys Gln Arg Lys Thr Ala Tyr Pro Leu
 290 295 300
 Leu Ile Phe Ala Ser Glu Ile Lys Lys Gly Glu Gln Leu Ala Glu Ile
 305 310 315 320
 Leu Gln Glu Gln Phe Pro Asn Glu Lys Ile Gly Phe Val Ser Ser Val
 325 330 335
 Thr Glu Asp Arg Leu Glu Gln Val Gln Ala Phe Arg Asp Gly Glu Leu
 340 345 350
 Thr Ile Leu Ile Ser Thr Thr Ile Leu Glu Arg Gly Val Thr Phe Pro
 355 360 365
 Cys Val Asp Val Phe Val Val Glu Ala Asn His Arg Leu Phe Thr Lys
 370 375 380
 Ser Ser Leu Ile Gln Ile Gly Gly Arg Val Gly Arg Ser Met Asp Arg
 385 390 395 400
 Pro Thr Gly Asp Leu Leu Phe Phe His Asp Gly Leu Asn Ala Ser Ile
 405 410 415

Lys Lys Ala Ile Lys Glu Ile Gln Met Met Asn Lys Glu Ala Gly Leu
420 425 430

<210> 129

<211> 870

<212> DNA

<213> Streptococcus pneumoniae

<400> 129

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atgcaaattc aaaaaagttt taaggggagc tctccctatg gcaagctgta tctagtggca 60
acgccgattg gcaatctaga tgatatgact tttcgtgcta tccagacctt gaaagaagtg 120
gactggattg ctgctgagga tacgcgcaat acagggcttt tgctcaagca ttttgacatt 180
tccaccaagc agatcagttt tcatgagcac aatgccaaagg aaaaaattcc tgatttgatt 240
ggtttcttga aagcagggca aagtattgct caggtctctg atgccgggtt gcctagcatt 300
tcagaccctg gtcatgattt agttaaggca gctattgagg aagaaattgc agttgtgaca 360
gttccagggt cctctgagg aatttctgcc ttgattgcca gtgggttagc gccacagcca 420
catatctttt acggtttttt accgagaaaa tcaggtcagc agaagcaatt ttttggttg 480
aaaaaagatt atcctgaaac acagattttt tatgaatcac ctcacgtgt agcagacacg 540
ttggaaaata tgtagaagt ctacggtgac cgctccgttg tcttggtcag ggaattgacc 600
aaaatctatg aagaatacca acgaggtact atctctgagt tattagaaa cattgctgaa 660
acgccactca agggcgaatg tcttctcatt gttgaggggt ccagtcaggg tgtggaggaa 720
aaggacgagg aagacttggt cgtagaaatt caaacccgca tccagcaagg tgtgaagaaa 780
aaccaagcta tcaaggaagt cgtaagatt taccagtgga ataaaagtca gctctacgct 840
gcctaccacg actgggaaga aaaacaataa 870
```

<210> 130

<211> 289

<212> PRT

<213> Streptococcus pneumoniae

<400> 130

```
Met Gln Ile Gln Lys Ser Phe Lys Gly Gln Ser Pro Tyr Gly Lys Leu
  1             5             10             15

Tyr Leu Val Ala Thr Pro Ile Gly Asn Leu Asp Asp Met Thr Phe Arg
      20             25             30

Ala Ile Gln Thr Leu Lys Glu Val Asp Trp Ile Ala Ala Glu Asp Thr
      35             40             45

Arg Asn Thr Gly Leu Leu Leu Lys His Phe Asp Ile Ser Thr Lys Gln
      50             55             60

Ile Ser Phe His Glu His Asn Ala Lys Glu Lys Ile Pro Asp Leu Ile
      65             70             75             80

Gly Phe Leu Lys Ala Gly Gln Ser Ile Ala Gln Val Ser Asp Ala Gly
      85             90             95

Leu Pro Ser Ile Ser Asp Pro Gly His Asp Leu Val Lys Ala Ala Ile
      100            105            110
```

Glu Glu Glu Ile Ala Val Val Thr Val Pro Gly Ala Ser Ala Gly Ile
 115 120 125
 Ser Ala Leu Ile Ala Ser Gly Leu Ala Pro Gln Pro His Ile Phe Tyr
 130 135 140
 Gly Phe Leu Pro Arg Lys Ser Gly Gln Gln Lys Gln Phe Phe Gly Leu
 145 150 155 160
 Lys Lys Asp Tyr Pro Glu Thr Gln Ile Phe Tyr Glu Ser Pro His Arg
 165 170 175
 Val Ala Asp Thr Leu Glu Asn Met Leu Glu Val Tyr Gly Asp Arg Ser
 180 185 190
 Val Val Leu Val Arg Glu Leu Thr Lys Ile Tyr Glu Glu Tyr Gln Arg
 195 200 205
 Gly Thr Ile Ser Glu Leu Leu Glu Ser Ile Ala Glu Thr Pro Leu Lys
 210 215 220
 Gly Glu Cys Leu Leu Ile Val Glu Gly Ala Ser Gln Gly Val Glu Glu
 225 230 235 240
 Lys Asp Glu Glu Asp Leu Phe Val Glu Ile Gln Thr Arg Ile Gln Gln
 245 250 255
 Gly Val Lys Lys Asn Gln Ala Ile Lys Glu Val Ala Lys Ile Tyr Gln
 260 265 270
 Trp Asn Lys Ser Gln Leu Tyr Ala Ala Tyr His Asp Trp Glu Glu Lys
 275 280 285

Gln

<210> 131
 <211> 345
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 131
 atgataaaga aaggaaaggg ctgttttatg gacaaaaaag aattatttga cgcgctggat 60
 gatttttccc aacaattatt ggtaacctta gccgatgtgg aagccatcaa gaaaaatctc 120
 aagagcctgg tagaggaaaa tacagctctt cgcttggaat atagtaagtt gcgagaacgc 180
 ttgggtgagg tggagcaga tgctcctgtc aaggccaagc atgttcgcga aagtgtccgt 240
 cgtatttacc gtgatggatt tcacgtatgt aatgattttt atggacaacg tcgagagcag 300
 gacgaagaat gtatgttttg tgacgagttg ttatacaggg agtaa 345

<210> 132
 <211> 114
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 132

Met Ile Lys Lys Gly Lys Gly Cys Phe Met Asp Lys Lys Glu Leu Phe
1 5 10 15

Asp Ala Leu Asp Asp Phe Ser Gln Gln Leu Leu Val Thr Leu Ala Asp
20 25 30

Val Glu Ala Ile Lys Lys Asn Leu Lys Ser Leu Val Glu Glu Asn Thr
35 40 45

Ala Leu Arg Leu Glu Asn Ser Lys Leu Arg Glu Arg Leu Gly Glu Val
50 55 60

Glu Ala Asp Ala Pro Val Lys Ala Lys His Val Arg Glu Ser Val Arg
65 70 75 80

Arg Ile Tyr Arg Asp Gly Phe His Val Cys Asn Asp Phe Tyr Gly Gln
85 90 95

Arg Arg Glu Gln Asp Glu Glu Cys Met Phe Cys Asp Glu Leu Leu Tyr
100 105 110

Arg Glu

<210> 133

<211> 639

<212> DNA

<213> Streptococcus pneumoniae

<400> 133

atgtcaaaag gatttttagt ctctcttgag ggaccagagg gagcaggcaa gaccagtgtt 60
ttagaggctc tgctaccaat tttagaggaa aaaggagtag aggtgttgac gaccctgtaa 120
cctggcggag tcttgattgg ggagaagatt cggaagtgat ttttgatcc aagtcatact 180
cagatggatg ctaaaacaga gctacttctc tatattgcca gtcgcagaca gcatttggtg 240
gaaaaagttc ttccagccct tgaagctggc aagttggtca tcatggatcg ttttatcgat 300
agttctgttg cctatcaggg atttggtcgt ggcttagata ttgaagccat tgactggctc 360
aatcagtttg cgacagatgg cctcaaaccg gatttgacac tctattttga catcgagggtg 420
gaagaagggc tggctcgtat tgctgctaag agtgaccgag aggttaaatcg tttggatttg 480
gaagggttgg acttgcataa aaaagttcgt caaggctacc tttctcttct ggataaagag 540
ggaaatcgca ttgtcaagat tgatgctagt ctcccttttg agcaagttgt ggaaactacc 600
aaggctgtct tgtttgacgg aatgggcttg gccaaatga 639

<210> 134

<211> 212

<212> PRT

<213> Streptococcus pneumoniae

<400> 134

Met Ser Lys Gly Phe Leu Val Ser Leu Glu Gly Pro Glu Gly Ala Gly
1 5 10 15

Lys Thr Ser Val Leu Glu Ala Leu Leu Pro Ile Leu Glu Glu Lys Gly

20 25 30
 Val Glu Val Leu Thr Thr Arg Glu Pro Gly Gly Val Leu Ile Gly Glu
 35 40 45
 Lys Ile Arg Glu Val Ile Leu Asp Pro Ser His Thr Gln Met Asp Ala
 50 55 60
 Lys Thr Glu Leu Leu Leu Tyr Ile Ala Ser Arg Arg Gln His Leu Val
 65 70 75 80
 Glu Lys Val Leu Pro Ala Leu Glu Ala Gly Lys Leu Val Ile Met Asp
 85 90 95
 Arg Phe Ile Asp Ser Ser Val Ala Tyr Gln Gly Phe Gly Arg Gly Leu
 100 105 110
 Asp Ile Glu Ala Ile Asp Trp Leu Asn Gln Phe Ala Thr Asp Gly Leu
 115 120 125
 Lys Pro Asp Leu Thr Leu Tyr Phe Asp Ile Glu Val Glu Glu Gly Leu
 130 135 140
 Ala Arg Ile Ala Ala Asn Ser Asp Arg Glu Val Asn Arg Leu Asp Leu
 145 150 155 160
 Glu Gly Leu Asp Leu His Lys Lys Val Arg Gln Gly Tyr Leu Ser Leu
 165 170 175
 Leu Asp Lys Glu Gly Asn Arg Ile Val Lys Ile Asp Ala Ser Leu Pro
 180 185 190
 Leu Glu Gln Val Val Glu Thr Thr Lys Ala Val Leu Phe Asp Gly Met
 195 200 205
 Gly Leu Ala Lys
 210

<210> 135
 <211> 474
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 135
 atggtagaac aaagaaaatc aattaccatg aaagatgttg ctttagaagc aggagttagt 60
 gttggaactg tttcacgtgt aattaataaa gaaaaaggca ttaaagaagt aactttgaaa 120
 aaagtggaac aagcgattaa aactttgaat tacattccag attactacgc tagaggaatg 180
 aaaaaaaatc gaacagaaac gattgcaatc attgtaccaa gtatctggca tcccttcttt 240
 tcagaatttg ctatgcatgt ggaaaatgaa gtctataaga gaaataacaa attactctta 300
 tgttctatca atggtacaaa tagagagcaa gactatctgg agatgttgcg tcataataaa 360
 gttgatggag tggttgccat tacctatagg ccaattgaac attacttgac gtcaggaatt 420
 ccctttgtta gtattgaccg cacatactca gagattgcca ttccttgtgt ttca 474

<210> 136

<211> 158
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 136
 Met Val Glu Gln Arg Lys Ser Ile Thr Met Lys Asp Val Ala Leu Glu
 1 5 10 15
 Ala Gly Val Ser Val Gly Thr Val Ser Arg Val Ile Asn Lys Glu Lys
 20 25 30
 Gly Ile Lys Glu Val Thr Leu Lys Lys Val Glu Gln Ala Ile Lys Thr
 35 40 45
 Leu Asn Tyr Ile Pro Asp Tyr Tyr Ala Arg Gly Met Lys Lys Asn Arg
 50 55 60
 Thr Glu Thr Ile Ala Ile Ile Val Pro Ser Ile Trp His Pro Phe Phe
 65 70 75 80
 Ser Glu Phe Ala Met His Val Glu Asn Glu Val Tyr Lys Arg Asn Asn
 85 90 95
 Lys Leu Leu Leu Cys Ser Ile Asn Gly Thr Asn Arg Glu Gln Asp Tyr
 100 105 110
 Leu Glu Met Leu Arg His Asn Lys Val Asp Gly Val Val Ala Ile Thr
 115 120 125
 Tyr Arg Pro Ile Glu His Tyr Leu Thr Ser Gly Ile Pro Phe Val Ser
 130 135 140
 Ile Asp Arg Thr Tyr Ser Glu Ile Ala Ile Pro Cys Val Ser
 145 150 155

<210> 137
 <211> 374
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 137
 atgaatatat ttagaacaaa gaatgttagt ttagataaaa cagagatgca taggcatttg 60
 aagttatggg atttgatttt gctgggtatc ggagccatgg tagggacagg cgtctttaca 120
 atcacaggta ctgcagctgc aacacttgct ggcccagccc tagtgatttc aatcgttatt 180
 tctgccttgt gtgtgggatt atcagccctc ttttttgcag aatttgctc gcgagtaccc 240
 gctacaggag gtgcctatag ttacctctat gctatcttag gagaattccc tgcctgggtg 300
 gctgggttgg taaccatgat ggagttcatg acagccatat caggcgtagc ttcgggttgg 360
 gcagcttatt ttaa 374

<210> 138
 <211> 124
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 138

Met Asn Ile Phe Arg Thr Lys Asn Val Ser Leu Asp Lys Thr Glu Met
1 5 10 15

His Arg His Leu Lys Leu Trp Asp Leu Ile Leu Leu Gly Ile Gly Ala
20 25 30

Met Val Gly Thr Gly Val Phe Thr Ile Thr Gly Thr Ala Ala Ala Thr
35 40 45

Leu Ala Gly Pro Ala Leu Val Ile Ser Ile Val Ile Ser Ala Leu Cys
50 55 60

Val Gly Leu Ser Ala Leu Phe Phe Ala Glu Phe Ala Ser Arg Val Pro
65 70 75 80

Ala Thr Gly Gly Ala Tyr Ser Tyr Leu Tyr Ala Ile Leu Gly Glu Phe
85 90 95

Pro Ala Trp Leu Ala Gly Trp Leu Thr Met Met Glu Phe Met Thr Ala
100 105 110

Ile Ser Gly Val Ala Ser Gly Trp Ala Ala Tyr Phe
115 120

<210> 139

<211> 1311

<212> DNA

<213> Streptococcus pneumoniae

<400> 139

atgaaatcaa gagtaaagga aacgagtatg gataaaattg tggttcaagg tggcgataat 60
cgtctggtag gaagcgtgac gatcgaggga gcaaaaaatg cagtcttacc cttgttggca 120
gcgactattc tagcaagtga aggaaagacc gtcttgacaga atgttccgat tttgtcggat 180
gtctttatta tgaatcaggt agttggtggt ttgaatgcc aagttgactt tgatgaggaa 240
gctcatcttg tcaaggtgga tgctactggc gacatcactg aggaagcccc ttacaagtat 300
gtcagcaaga tgcgcgcctc catcggttgta ttagggccaa tccttgcccg tgtgggtcat 360
gccaaggtat ccatgccagg tggttgtacg attggttagcc gtcctattga tcttcatttg 420
aaaggtcttg aagctatggg gggttaagatt agtcagacag ctgggtacat cgaagccaag 480
gcagaacgct tgcattggtg tcatatctat atggactttc caagtgttg tgcaacgcag 540
aacttgatga tggcagcgac tctggctgat ggggtgacag tgattgagaa tgctgcgcgt 600
gagcctgaga ttgttgactt agccattctc cttaatgaaa tgggagccaa ggtcaaagg 660
gctggtacag agactataac cattactggt gttgagaaac ttcattggtac gactcacaat 720
gtagtccaag accgtatcga agcaggaacc tttatggtag ctgctgccat gactggtggt 780
gatgtcttga ttcgagacgc tgtctgggag cacaaccgtc ccttgattgc caagttactt 840
gaaatgggtg ttgaagtaat tgaagaagac gaaggaattc gtgttcggtc tcaactagaa 900
aatctaaaag ctgttcatgt gaaaaccttg cccacccag gatttccaac agatatgcag 960
gctcaattta cagccttgat gacagttgca aaaggcgaat caaccatggt ggagacagtt 1020
ttcgaaaatc gtttccaaca cctagaagag atgcgcgcga tgggcttgca ttctgagatt 1080
atccgtgata cagctcgtat tgttggtgga cagcctttgc agggagcaga agttctttca 1140
actgaccttc gtgccagtgc ggccttgatt ttgacagggt tggtagcaca gggagaaact 1200
gtggtcggta aattggttca cttggataga ggttactacg gtttccatga gaagttggcg 1260
cagctaggtg ctaagattca gcggattgag gcaagtgatg aagatgaata a 1311

<210> 140
 <211> 436
 <212> PRT
 <213> Streptococcus pneumoniae

 <400> 140
 Met Lys Ser Arg Val Lys Glu Thr Ser Met Asp Lys Ile Val Val Gln
 1 5 10 15
 Gly Gly Asp Asn Arg Leu Val Gly Ser Val Thr Ile Glu Gly Ala Lys
 20 25 30
 Asn Ala Val Leu Pro Leu Leu Ala Ala Thr Ile Leu Ala Ser Glu Gly
 35 40 45
 Lys Thr Val Leu Gln Asn Val Pro Ile Leu Ser Asp Val Phe Ile Met
 50 55 60
 Asn Gln Val Val Gly Gly Leu Asn Ala Lys Val Asp Phe Asp Glu Glu
 65 70 75 80
 Ala His Leu Val Lys Val Asp Ala Thr Gly Asp Ile Thr Glu Glu Ala
 85 90 95
 Pro Tyr Lys Tyr Val Ser Lys Met Arg Ala Ser Ile Val Val Leu Gly
 100 105 110
 Pro Ile Leu Ala Arg Val Gly His Ala Lys Val Ser Met Pro Gly Gly
 115 120 125
 Cys Thr Ile Gly Ser Arg Pro Ile Asp Leu His Leu Lys Gly Leu Glu
 130 135 140
 Ala Met Gly Val Lys Ile Ser Gln Thr Ala Gly Tyr Ile Glu Ala Lys
 145 150 155 160
 Ala Glu Arg Leu His Gly Ala His Ile Tyr Met Asp Phe Pro Ser Val
 165 170 175
 Gly Ala Thr Gln Asn Leu Met Met Ala Ala Thr Leu Ala Asp Gly Val
 180 185 190
 Thr Val Ile Glu Asn Ala Ala Arg Glu Pro Glu Ile Val Asp Leu Ala
 195 200 205
 Ile Leu Leu Asn Glu Met Gly Ala Lys Val Lys Gly Ala Gly Thr Glu
 210 215 220
 Thr Ile Thr Ile Thr Gly Val Glu Lys Leu His Gly Thr Thr His Asn
 225 230 235 240
 Val Val Gln Asp Arg Ile Glu Ala Gly Thr Phe Met Val Ala Ala Ala
 245 250 255
 Met Thr Gly Gly Asp Val Leu Ile Arg Asp Ala Val Trp Glu His Asn
 260 265 270

Arg Pro Leu Ile Ala Lys Leu Leu Glu Met Gly Val Glu Val Ile Glu
 275 280 285
 Glu Asp Glu Gly Ile Arg Val Arg Ser Gln Leu Glu Asn Leu Lys Ala
 290 295 300
 Val His Val Lys Thr Leu Pro His Pro Gly Phe Pro Thr Asp Met Gln
 305 310 315 320
 Ala Gln Phe Thr Ala Leu Met Thr Val Ala Lys Gly Glu Ser Thr Met
 325 330 335
 Val Glu Thr Val Phe Glu Asn Arg Phe Gln His Leu Glu Glu Met Arg
 340 345 350
 Arg Met Gly Leu His Ser Glu Ile Ile Arg Asp Thr Ala Arg Ile Val
 355 360 365
 Gly Gly Gln Pro Leu Gln Gly Ala Glu Val Leu Ser Thr Asp Leu Arg
 370 375 380
 Ala Ser Ala Ala Leu Ile Leu Thr Gly Leu Val Ala Gln Gly Glu Thr
 385 390 395 400
 Val Val Gly Lys Leu Val His Leu Asp Arg Gly Tyr Tyr Gly Phe His
 405 410 415
 Glu Lys Leu Ala Gln Leu Gly Ala Lys Ile Gln Arg Ile Glu Ala Ser
 420 425 430
 Asp Glu Asp Glu
 435

<210> 141
 <211> 1101
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 141
 atgttattag cgtcaacagt agccttgtca tttgccccag tattggcaac tcaagcagaa 60
 gaagttcttt ggactgcacg tagtggtgag caaatccaaa acgatttgac taaaacggac 120
 aacaaaacaa gttataccgt acagtatggt gatactttga gcaccattgc agaagccttg 180
 ggtgtagatg tcacagtgct tgcgaatctg aacaaaatca ctaatatgga cttgattttc 240
 ccagaaactg ttttgacaac gactgtcaat gaagcagaag aagtaacaga agttgaaatc 300
 caaacacctc aagcagactc tagtgaagaa gtgacaactg cgacagcaga tttgaccact 360
 aatcaagtga ccgttgatga tcaaactgtt cagggttcag acctttctca accaattgca 420
 gaagttacaa agacagtgat tgcttctgaa gaagtggcac catctacggg cacttctgtc 480
 ccagaggagc aaacgaccga aacaactcgc ccagttgcag aagaagctcc tcaggaaacg 540
 actccagctg agaagcagga aacacaaaca agccctcaag ctgcatcagc agtggaagca 600
 actacaacaa gttcagaagc aaaagaagta gcatcatcaa atggagctac agcagcagtt 660
 tctacttatc aaccagaaga aacgaaagta atttcaacaa cttacgaggc tccagctgcg 720
 cccgattatg ctggacttgc agtagcaaaa tctgaaaatg cagggtcttca accacaaaca 780
 gctgccttta agaagaaatt gctaacttgt ttggcattac atcctttagt ggttatcgtc 840
 caggagacag tggagatcac ggaaaagggt tggtatcgga ctttatggta ccagaacggt 900
 cagaattagg ggataagatt gcggaatatg ctattcaaaa tatggccagc cgtggcatta 960

gttacatcat ctggaaacaa cgtttctatg ctccattcga tagcaaatat gggccagcta 1020
acacttgga cccaatgcc gaccgtggta gtgtgacaga aaatcactat gatcacgttc 1080
acgtttcaat gaatggataa 1100

<210> 142
<211> 302
<212> PRT
<213> Streptococcus pneumoniae

<400> 142
Met Leu Leu Ala Ser Thr Val Ala Leu Ser Phe Ala Pro Val Leu Ala
1 5 10 15
Thr Gln Ala Glu Glu Val Leu Trp Thr Ala Arg Ser Val Glu Gln Ile
20 25 30
Gln Asn Asp Leu Thr Lys Thr Asp Asn Lys Thr Ser Tyr Thr Val Gln
35 40 45
Tyr Gly Asp Thr Leu Ser Thr Ile Ala Glu Ala Leu Gly Val Asp Val
50 55 60
Thr Val Leu Ala Asn Leu Asn Lys Ile Thr Asn Met Asp Leu Ile Phe
65 70 75 80
Pro Glu Thr Val Leu Thr Thr Thr Val Asn Glu Ala Glu Glu Val Thr
85 90 95
Glu Val Glu Ile Gln Thr Pro Gln Ala Asp Ser Ser Glu Glu Val Thr
100 105 110
Thr Ala Thr Ala Asp Leu Thr Thr Asn Gln Val Thr Val Asp Asp Gln
115 120 125
Thr Val Gln Val Ala Asp Leu Ser Gln Pro Ile Ala Glu Val Thr Lys
130 135 140
Thr Val Ile Ala Ser Glu Glu Val Ala Pro Ser Thr Gly Thr Ser Val
145 150 155 160
Pro Glu Glu Gln Thr Thr Glu Thr Thr Arg Pro Val Ala Glu Glu Ala
165 170 175
Pro Gln Glu Thr Thr Pro Ala Glu Lys Gln Glu Thr Gln Thr Ser Pro
180 185 190
Gln Ala Ala Ser Ala Val Glu Ala Thr Thr Thr Ser Ser Glu Ala Lys
195 200 205
Glu Val Ala Ser Ser Asn Gly Ala Thr Ala Ala Val Ser Thr Tyr Gln
210 215 220
Pro Glu Glu Thr Lys Val Ile Ser Thr Thr Tyr Glu Ala Pro Ala Ala

Val Ala His Leu Gly Leu Ile Ala Ile Ser Gly Val Ser Val Ala Gly
 35 40 45
 Asn Ile Ile Thr Ile Tyr Gln Ala Ile Phe Ile Ala Leu Gly Ala Ala
 50 55 60
 Ile Ser Ser Val Ile Ser Lys Ser Ile Gly Gln Lys Asp Gln Ser Lys
 65 70 75 80
 Leu Ala Tyr His Val Thr Glu Ala Leu Lys Ile Thr Leu Leu Leu Ser
 85 90 95
 Phe Leu Leu Gly Phe Leu Ser Ile Phe Ala Gly Lys Glu Met Ile Gly
 100 105 110
 Leu Leu Gly Thr Glu Arg Asp Val Ala Glu Ser Gly Gly Leu Tyr Leu
 115 120 125
 Ser Leu Val Gly Gly Ser Ile Val Leu Leu Gly Leu Met Thr Ser Leu
 130 135 140
 Gly Ala Leu Ile Arg Ala Thr His Asn Pro Arg Leu Pro Leu Tyr Val
 145 150 155 160
 Ser Phe Leu Ser Asn Ala Leu Asn Ile Leu Phe Ser Ser Leu Ala Ile
 165 170 175
 Phe Val Leu Asp Met Gly Ile Ala Gly Val Ala Trp Gly Thr Ile Val
 180 185 190
 Ser Arg Leu Val Gly Leu Val Ile Leu Trp Ser Gln Leu Lys Leu Pro
 195 200 205
 Tyr Gly Lys Pro Thr Phe Gly Leu Asp Lys Glu Leu Leu Thr Leu Ala
 210 215 220
 Leu Pro Ala Ala Gly Glu Arg Leu Met Met Arg Ala Gly Asp Val Val
 225 230 235 240
 Ile Ile Ala Leu Val Val Ser Phe Gly Thr Glu Ala Val Ala Gly Asn
 245 250 255
 Ala Ile Gly Glu Val Leu Thr Gln Phe Asn Tyr Met Pro Ala Phe Gly
 260 265 270
 Val Ala Thr Ala Thr Val Met Leu Leu Ala Arg Ala Val Gly Glu Asp
 275 280 285
 Asp Trp Lys Arg Val Ala Ser Leu Ser Lys Gln Thr Phe Trp Leu Ser
 290 295 300
 Leu Phe Leu Met Leu Pro Leu Ser Phe Ser Ile Tyr Val Leu Gly Val
 305 310 315 320
 Pro Leu Thr His Leu Tyr Thr Thr Asp Ser Leu Ala Val Glu Ala Ser
 325 330 335

Val Leu Val Thr Leu Phe Ser Leu Leu Gly Thr Pro Met Thr Thr Gly
340 345 350

Thr Val Ile Tyr Thr Ala Val Trp Gln Gly Leu Gly Asn Ala Arg Leu
355 360 365

Pro Phe Tyr Ala Thr Ser Ile Gly Met Trp Cys Ile Arg Ile Gly Thr
370 375 380

Gly Tyr Leu Met Gly Ile Val Leu Gly Trp Gly Leu Pro Gly Ile Trp
385 390 395 400

Ala Gly Ser Leu Leu Asp Asn Gly Phe Arg Trp Leu Phe Leu Arg Tyr
405 410 415

Arg Tyr Gln Arg Tyr Met Ser Leu Lys Gly
420 425

<210> 145
<211> 894
<212> DNA
<213> Streptococcus pneumoniae

<400> 145
gtgggaagaa ttatcagagc aggtgtaaag atggaacatc ttggaaaagt atttcgtgaa 60
tttcgaacaa gtggaaatta ttcttttaaag gaagcagcag gcgaatcctg ctctacctct 120
cagttatctc gctttgagct tggggagtct gacctggcag tctcccgttt ctttgagatt 180
ttggataaca ttcattgtaac aatcgaaaat ttcattggata aggcaaggaa ttttcataat 240
catgaacatg tgtctatgat ggcacagatt atcccacttt actattcaaa cgatattgca 300
ggtttttcaaa agcttcaaaag agaacaactt gaaaagtcta agagttcgcac gactcccctt 360
tatttttgagc tgaactggat tttgctacaa ggtctgattt gtcaaagaga tgcgagttat 420
gatatgaagc aggatgattt gggtaaggta gcagattatc tcttcaaaac agaagaatgg 480
accatgtatg agttgattct tttcggtaac ctctatagtt tctacgatgt agactatgtc 540
actcggattg gtagagaagt tatggagagg gaggaatttt accaagagat tagtcgccat 600
aagagattag tggtgatttt ggccctcaat tgttaccagc attgttttaga gcattcttct 660
ttttataatg ccaactatct tgaggcttat acagagaaga ttattgacaa aggtattaag 720
ctttatgagc gtaatgtttt ccattattta aaagggtttg ctttatatca aaaaggacag 780
tgtaaagaag gctgtaagca gatgcaagag gccatgcata tttttgatgt gttagggtctt 840
ccagagcaag tagcctatta tcaggaacac tacgaaaaat ttgtcaaaag ttaa 894

<210> 146
<211> 297
<212> PRT
<213> Streptococcus pneumoniae

<400> 146
Val Gly Arg Ile Ile Arg Ala Gly Val Lys Met Glu His Leu Gly Lys
1 5 10 15

Val Phe Arg Glu Phe Arg Thr Ser Gly Asn Tyr Ser Leu Lys Glu Ala
20 25 30

Ala Gly Glu Ser Cys Ser Thr Ser Gln Leu Ser Arg Phe Glu Leu Gly

| 35 | | | | | 40 | | | | | 45 | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Glu | Ser | Asp | Leu | Ala | Val | Ser | Arg | Phe | Phe | Glu | Ile | Leu | Asp | Asn | Ile |
| 50 | | | | | | 55 | | | | | 60 | | | | |
| His | Val | Thr | Ile | Glu | Asn | Phe | Met | Asp | Lys | Ala | Arg | Asn | Phe | His | Asn |
| 65 | | | | | 70 | | | | | 75 | | | | | 80 |
| His | Glu | His | Val | Ser | Met | Met | Ala | Gln | Ile | Ile | Pro | Leu | Tyr | Tyr | Ser |
| | | | | 85 | | | | | 90 | | | | | 95 | |
| Asn | Asp | Ile | Ala | Gly | Phe | Gln | Lys | Leu | Gln | Arg | Glu | Gln | Leu | Glu | Lys |
| | | | 100 | | | | | 105 | | | | | 110 | | |
| Ser | Lys | Ser | Ser | Thr | Thr | Pro | Leu | Tyr | Phe | Glu | Leu | Asn | Trp | Ile | Leu |
| | 115 | | | | | | 120 | | | | | 125 | | | |
| Leu | Gln | Gly | Leu | Ile | Cys | Gln | Arg | Asp | Ala | Ser | Tyr | Asp | Met | Lys | Gln |
| | 130 | | | | | 135 | | | | | 140 | | | | |
| Asp | Asp | Leu | Gly | Lys | Val | Ala | Asp | Tyr | Leu | Phe | Lys | Thr | Glu | Glu | Trp |
| 145 | | | | | 150 | | | | | 155 | | | | | 160 |
| Thr | Met | Tyr | Glu | Leu | Ile | Leu | Phe | Gly | Asn | Leu | Tyr | Ser | Phe | Tyr | Asp |
| | | | 165 | | | | | 170 | | | | | | 175 | |
| Val | Asp | Tyr | Val | Thr | Arg | Ile | Gly | Arg | Glu | Val | Met | Glu | Arg | Glu | Glu |
| | | | 180 | | | | 185 | | | | | | 190 | | |
| Phe | Tyr | Gln | Glu | Ile | Ser | Arg | His | Lys | Arg | Leu | Val | Leu | Ile | Leu | Ala |
| | 195 | | | | | | 200 | | | | | 205 | | | |
| Leu | Asn | Cys | Tyr | Gln | His | Cys | Leu | Glu | His | Ser | Ser | Phe | Tyr | Asn | Ala |
| | 210 | | | | | 215 | | | | | 220 | | | | |
| Asn | Tyr | Phe | Glu | Ala | Tyr | Thr | Glu | Lys | Ile | Ile | Asp | Lys | Gly | Ile | Lys |
| 225 | | | | | 230 | | | | | 235 | | | | | 240 |
| Leu | Tyr | Glu | Arg | Asn | Val | Phe | His | Tyr | Leu | Lys | Gly | Phe | Ala | Leu | Tyr |
| | | | 245 | | | | | | 250 | | | | | 255 | |
| Gln | Lys | Gly | Gln | Cys | Lys | Glu | Gly | Cys | Lys | Gln | Met | Gln | Glu | Ala | Met |
| | | 260 | | | | | | 265 | | | | | 270 | | |
| His | Ile | Phe | Asp | Val | Leu | Gly | Leu | Pro | Glu | Gln | Val | Ala | Tyr | Tyr | Gln |
| | 275 | | | | | | 280 | | | | | 285 | | | |
| Glu | His | Tyr | Glu | Lys | Phe | Val | Lys | Ser | | | | | | | |
| | 290 | | | | | 295 | | | | | | | | | |

<210> 147

<211> 1068

<212> DNA

<213> Streptococcus pneumoniae

<400> 147

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atgtctaaca ttcaaaacat gtccctggag gacatcatgg gagagcgctt tggtcgctac 60
tccaagtaca ttattcaaga ccgggctttg ccagatatcc gtgatgggtt gaagccgggt 120
cagcgccgta ttctttattc tatgaataag gatagcaata cttttgacaa gagctaccgt 180
aagtcggcca agtcagtcgg gaacatcatg gggaatttcc acccacacgg ggattcttct 240
atctatgatg ccatggttcg tatgtcacag aactggaaaa atcgtgagat tctagttgaa 300
atgcacggta ataacggttc tatggacgga gatcctcctg cggctatgcy ttatactgag 360
gcacgtttgt ctgaaattgc aggctacctt cttcaggata tcgagaaaaa gacagttcct 420
tttgcatgga actttgacga tacggagaaa gaaccaacgg tcttgccagc agcctttcca 480
aacctcttgg tcaatggttc gactgggatt tcggctggtt atgccacaga cattcctccc 540
cataatttag ctgagggtcat agatgctgca gtttacctga ttgaccaccc aactgcaaag 600
attgataaac tcatggaatt cttgcctgga ccagacttcc ctacaggggc tattattcag 660
ggtcgtgatg aaatcaagaa agcttatgag actgggaaa ggccgctggt tgttcgttcc 720
aagactgaaa ttgaaaagct aaaaggtggt aaggaacaaa tcgttattat tgagattcct 780
tatgaaatca ataaggccaa tctagtcaag aaaatcgatg atgttcgtgt taataacaag 840
gtagctggga ttgctgaggt tcgtgatgag tctgaccgtg atggctcttcg tatcgctatc 900
gaacttaaga aagacgctaa tactgagctt gttctcaact acttatttaa gtacaccgac 960
ctacaaatca actacaactt taatatggtg gcgattgaca atttcacacc tcgtcaggtt 1020
ggattgttcc aatcctgtct agctatatcg ctcaccgtcg agaagtga 1068
```

<210> 148

<211> 355

<212> PRT

<213> Streptococcus pneumoniae

<400> 148

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Met Ser Asn Ile Gln Asn Met Ser Leu Glu Asp Ile Met Gly Glu Arg
 1             5             10             15

Phe Gly Arg Tyr Ser Lys Tyr Ile Ile Gln Asp Arg Ala Leu Pro Asp
 20             25             30

Ile Arg Asp Gly Leu Lys Pro Val Gln Arg Arg Ile Leu Tyr Ser Met
 35             40             45

Asn Lys Asp Ser Asn Thr Phe Asp Lys Ser Tyr Arg Lys Ser Ala Lys
 50             55             60

Ser Val Gly Asn Ile Met Gly Asn Phe His Pro His Gly Asp Ser Ser
 65             70             75             80

Ile Tyr Asp Ala Met Val Arg Met Ser Gln Asn Trp Lys Asn Arg Glu
 85             90             95

Ile Leu Val Glu Met His Gly Asn Asn Gly Ser Met Asp Gly Asp Pro
100             105             110

Pro Ala Ala Met Arg Tyr Thr Glu Ala Arg Leu Ser Glu Ile Ala Gly
115             120             125

Tyr Leu Leu Gln Asp Ile Glu Lys Lys Thr Val Pro Phe Ala Trp Asn
130             135             140

Phe Asp Asp Thr Glu Lys Glu Pro Thr Val Leu Pro Ala Ala Phe Pro
145             150             155             160
```

Asn Leu Leu Val Asn Gly Ser Thr Gly Ile Ser Ala Gly Tyr Ala Thr
 165 170 175
 Asp Ile Pro Pro His Asn Leu Ala Glu Val Ile Asp Ala Ala Val Tyr
 180 185 190
 Met Ile Asp His Pro Thr Ala Lys Ile Asp Lys Leu Met Glu Phe Leu
 195 200 205
 Pro Gly Pro Asp Phe Pro Thr Gly Ala Ile Ile Gln Gly Arg Asp Glu
 210 215 220
 Ile Lys Lys Ala Tyr Glu Thr Gly Lys Gly Arg Val Val Val Arg Ser
 225 230 235 240
 Lys Thr Glu Ile Glu Lys Leu Lys Gly Gly Lys Glu Gln Ile Val Ile
 245 250 255
 Ile Glu Ile Pro Tyr Glu Ile Asn Lys Ala Asn Leu Val Lys Lys Ile
 260 265 270
 Asp Asp Val Arg Val Asn Asn Lys Val Ala Gly Ile Ala Glu Val Arg
 275 280 285
 Asp Glu Ser Asp Arg Asp Gly Leu Arg Ile Ala Ile Glu Leu Lys Lys
 290 295 300
 Asp Ala Asn Thr Glu Leu Val Leu Asn Tyr Leu Phe Lys Tyr Thr Asp
 305 310 315 320
 Leu Gln Ile Asn Tyr Asn Phe Asn Met Val Ala Ile Asp Asn Phe Thr
 325 330 335
 Pro Arg Gln Val Gly Leu Phe Gln Ser Cys Leu Ala Ile Ser Leu Thr
 340 345 350
 Val Glu Lys
 355

<210> 149
 <211> 684
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 149
 atgccgacat tagaaatagc acaaaaaaaaa ctggagttca ttaagaaggc agaagaatat 60
 tacaatgcct tgtgtacaaa tatacagttg agcggagata aactaaaagt aatttccggt 120
 acttctgtta accctgggga aggaaaaaca actacttcca taaatatagc atggtcggtt 180
 gcgcgtgcag gctataaaac tcttttgatc gatggcgata ctcgaaattc agttatgtta 240
 ggagttttta aatctcgtga aaaaattaca gggctaacag aatttttatc tgggacagct 300
 gatttatctc acggtttatg tgatacaaat attgaaaatt tattttagt tcaatcggga 360
 tctgtatcac caaacctac agccttggtta caaagtaaaa attttaatga tatgattgaa 420
 acattgcgta aatattttga ttatatcatt attgatacac cgcctattgg aattgttatt 480
 gatgcggcaa ttatcactca aaagtgtgat gcgtccatct tggtaacagc aacaggtgag 540
 gcgaataaac gtgatatcca aaaagcgaaa caacaattaa aacaaacagg gaaactgttc 600

ctaggagttg ttttaaataa attggatatc tcggttaata agtatggagt ttacggttcc 660
 tatggaaatt atggtaaaaa ataa 684

<210> 150
 <211> 227
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 150
 Met Pro Thr Leu Glu Ile Ala Gln Lys Lys Leu Glu Phe Ile Lys Lys
 1 5 10 15
 Ala Glu Glu Tyr Tyr Asn Ala Leu Cys Thr Asn Ile Gln Leu Ser Gly
 20 25 30
 Asp Lys Leu Lys Val Ile Ser Val Thr Ser Val Asn Pro Gly Glu Gly
 35 40 45
 Lys Thr Thr Thr Ser Ile Asn Ile Ala Trp Ser Phe Ala Arg Ala Gly
 50 55 60
 Tyr Lys Thr Leu Leu Ile Asp Gly Asp Thr Arg Asn Ser Val Met Leu
 65 70 75 80
 Gly Val Phe Lys Ser Arg Glu Lys Ile Thr Gly Leu Thr Glu Phe Leu
 85 90 95
 Ser Gly Thr Ala Asp Leu Ser His Gly Leu Cys Asp Thr Asn Ile Glu
 100 105 110
 Asn Leu Phe Val Val Gln Ser Gly Ser Val Ser Pro Asn Pro Thr Ala
 115 120 125
 Leu Leu Gln Ser Lys Asn Phe Asn Asp Met Ile Glu Thr Leu Arg Lys
 130 135 140
 Tyr Phe Asp Tyr Ile Ile Ile Asp Thr Pro Pro Ile Gly Ile Val Ile
 145 150 155 160
 Asp Ala Ala Ile Ile Thr Gln Lys Cys Asp Ala Ser Ile Leu Val Thr
 165 170 175
 Ala Thr Gly Glu Ala Asn Lys Arg Asp Ile Gln Lys Ala Lys Gln Gln
 180 185 190
 Leu Lys Gln Thr Gly Lys Leu Phe Leu Gly Val Val Leu Asn Lys Leu
 195 200 205
 Asp Ile Ser Val Asn Lys Tyr Gly Val Tyr Gly Ser Tyr Gly Asn Tyr
 210 215 220
 Gly Lys Lys
 225

<210> 151
 <211> 1194
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 151
 atggaggcaa atatgaaaca tctaaaaaca ttttacaaaa aatgggtttca attattagtc 60
 gttatcgtca ttagcttttt tagtggagcc ttgggtagtt tttcaataac tcaactaact 120
 caaaaaagta gtgtaaaca ctctaacaac aatagtacta ttacacaaac tgctataag 180
 aacgaaaatt caacaacaca ggctgttaac aaagtaaaag atgctgttgt ttctgttatt 240
 acttattcgg caaacagaca aaatagcgtt tttggcaatg atgatactga cacagattct 300
 cagcgaatct ctagtgaagg atctggagtt atttataaaa agaataataa agaagcttac 360
 atcgtcacca acaatcacgt tattaatggc gccagcaaag tagatattcg attgtcagat 420
 gggactaaag tacctggaga aattgtcggg gctgacactt tctctgatat tgctgtcgtc 480
 aaaatctctt cagaaaaagt gacaacagta gctgagtttg gtgattctag taagttaact 540
 gtaggagaaa ctgctattgc catcggtagc ccgttagggt ctgaatatgc aaatactgtc 600
 actcaaggta tcgtatccag tctcaataga aatgtatcct taaaatcgga agatggacaa 660
 gctatttcta caaaagccat ccaaactgat actgctatta acccaggtaa ctctggcggc 720
 ccactgatca atattcaagg gcaggttatc ggaattacct caagtaaaat tgctacaaat 780
 ggaggaacat ctgtagaagg tcttggtttc gcaattcctg caaatgatgc tatcaatatt 840
 attgaacagt tagaaaaaaa cggaaaagtg acgcgtccag ctttggaat ccagatgggt 900
 aatttatcta atgtgagtac aagcgacatc agaagactca atattccaag taatgttaca 960
 tctgggtgaa ttgttcgttc ggtacaaagt aatagcctg ccaatgggtc ccttgaaaaa 1020
 tacgatgtaa ttacaaaagt agatgacaaa gagattgctt catcaacaga cttacaaaag 1080
 gctctttaca accattctat cggagacacc attaagataa cctactatcg taacgggaaa 1140
 gaagaaacta cctctatcaa acttaacaag agttcagggt atttagaatc ttaa 1194

<210> 152
 <211> 397
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 152
 Met Glu Ala Asn Met Lys His Leu Lys Thr Phe Tyr Lys Lys Trp Phe
 1 5 10 15
 Gln Leu Leu Val Val Ile Val Ile Ser Phe Phe Ser Gly Ala Leu Gly
 20 25 30
 Ser Phe Ser Ile Thr Gln Leu Thr Gln Lys Ser Ser Val Asn Asn Ser
 35 40 45
 Asn Asn Asn Ser Thr Ile Thr Gln Thr Ala Tyr Lys Asn Glu Asn Ser
 50 55 60
 Thr Thr Gln Ala Val Asn Lys Val Lys Asp Ala Val Val Ser Val Ile
 65 70 75 80
 Thr Tyr Ser Ala Asn Arg Gln Asn Ser Val Phe Gly Asn Asp Asp Thr
 85 90 95
 Asp Thr Asp Ser Gln Arg Ile Ser Ser Glu Gly Ser Gly Val Ile Tyr
 100 105 110
 Lys Lys Asn Asp Lys Glu Ala Tyr Ile Val Thr Asn Asn His Val Ile
 115 120 125

Asn Gly Ala Ser Lys Val Asp Ile Arg Leu Ser Asp Gly Thr Lys Val
 130 135 140
 Pro Gly Glu Ile Val Gly Ala Asp Thr Phe Ser Asp Ile Ala Val Val
 145 150 155 160
 Lys Ile Ser Ser Glu Lys Val Thr Thr Val Ala Glu Phe Gly Asp Ser
 165 170 175
 Ser Lys Leu Thr Val Gly Glu Thr Ala Ile Ala Ile Gly Ser Pro Leu
 180 185 190
 Gly Ser Glu Tyr Ala Asn Thr Val Thr Gln Gly Ile Val Ser Ser Leu
 195 200 205
 Asn Arg Asn Val Ser Leu Lys Ser Glu Asp Gly Gln Ala Ile Ser Thr
 210 215 220
 Lys Ala Ile Gln Thr Asp Thr Ala Ile Asn Pro Gly Asn Ser Gly Gly
 225 230 235 240
 Pro Leu Ile Asn Ile Gln Gly Gln Val Ile Gly Ile Thr Ser Ser Lys
 245 250 255
 Ile Ala Thr Asn Gly Gly Thr Ser Val Glu Gly Leu Gly Phe Ala Ile
 260 265 270
 Pro Ala Asn Asp Ala Ile Asn Ile Ile Glu Gln Leu Glu Lys Asn Gly
 275 280 285
 Lys Val Thr Arg Pro Ala Leu Gly Ile Gln Met Val Asn Leu Ser Asn
 290 295 300
 Val Ser Thr Ser Asp Ile Arg Arg Leu Asn Ile Pro Ser Asn Val Thr
 305 310 315 320
 Ser Gly Val Ile Val Arg Ser Val Gln Ser Asn Met Pro Ala Asn Gly
 325 330 335
 His Leu Glu Lys Tyr Asp Val Ile Thr Lys Val Asp Asp Lys Glu Ile
 340 345 350
 Ala Ser Ser Thr Asp Leu Gln Ser Ala Leu Tyr Asn His Ser Ile Gly
 355 360 365
 Asp Thr Ile Lys Ile Thr Tyr Tyr Arg Asn Gly Lys Glu Glu Thr Thr
 370 375 380
 Ser Ile Lys Leu Asn Lys Ser Ser Gly Asp Leu Glu Ser
 385 390 395

<210> 153
 <211> 939
 <212> DNA

<213> Streptococcus pneumoniae

<400> 153

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taccagttgc tcaaggaaac agaccatgca gaaacgggtcc aagtgattta cgatgagaag 180
gaagtgtcac tcagagagat tttactttat tatttccgag ttatcgatcc tctatctatc 240
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gcagatttgc cagctatcta cacagtggcg caggagcagg aacgcatgct gggtcgaaaag 360
attgcagtag aagtggagca attacgccac tacattctgg ctgaagacta ccaccaagac 420
tatctcagga agaataccttc aggttactgt catatcgatg tgaccgatgc tgataagcca 480
ttgattgatg cagcaaaacta tgaaaagcct agtcaagagg tgttgaaggc cagtctatct 540
gaagagtctt atcgtgtcac acaagaagct gctacagagg ctccatttac caatgcctat 600
gaccaaactt ttgaagaggg gatttatgta gatattacga caggtgagcc actctttttt 660
gccaaggata agtttgcttc aggttgtggt tggccaagtt ttagccgtcc gatttcctaa 720
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cgttcaggca gtgctcactt gggtcatggt ttcacagatg gaccgcggga gttaggcggc 840
ctccgttact gtatcaattc tgcttcttta cgctttgtgg ccaaggatga gatggaaaaa 900
gcaggatatg gctatctatt gccttactta aacaaataa 939

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<210> 154

<211> 312

<212> PRT

<213> Streptococcus pneumoniae

<400> 154

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Met Ala Glu Ile Tyr Leu Ala Gly Gly Cys Phe Trp Gly Leu Glu Glu
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Tyr Phe Ser Arg Ile Ser Gly Val Leu Glu Thr Ser Val Gly Tyr Ala
      20             25            30

Asn Gly Gln Val Glu Thr Thr Asn Tyr Gln Leu Leu Lys Glu Thr Asp
      35             40            45

His Ala Glu Thr Val Gln Val Ile Tyr Asp Glu Lys Glu Val Ser Leu
      50             55            60

Arg Glu Ile Leu Leu Tyr Tyr Phe Arg Val Ile Asp Pro Leu Ser Ile
      65             70            75            80

Asn Gln Gln Gly Asn Asp Arg Gly Arg Gln Tyr Arg Thr Gly Ile Tyr
      85             90            95

Tyr Gln Asp Glu Ala Asp Leu Pro Ala Ile Tyr Thr Val Val Gln Glu
      100            105            110

Gln Glu Arg Met Leu Gly Arg Lys Ile Ala Val Glu Val Glu Gln Leu
      115            120            125

Arg His Tyr Ile Leu Ala Glu Asp Tyr His Gln Asp Tyr Leu Arg Lys
      130            135            140

Asn Pro Ser Gly Tyr Cys His Ile Asp Val Thr Asp Ala Asp Lys Pro
      145            150            155            160

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Leu Ile Asp Ala Ala Asn Tyr Glu Lys Pro Ser Gln Glu Val Leu Lys
 165 170 175
 Ala Ser Leu Ser Glu Glu Ser Tyr Arg Val Thr Gln Glu Ala Ala Thr
 180 185 190
 Glu Ala Pro Phe Thr Asn Ala Tyr Asp Gln Thr Phe Glu Glu Gly Ile
 195 200 205
 Tyr Val Asp Ile Thr Thr Gly Glu Pro Leu Phe Phe Ala Lys Asp Lys
 210 215 220
 Phe Ala Ser Gly Cys Gly Trp Pro Ser Phe Ser Arg Pro Ile Ser Lys
 225 230 235 240
 Glu Leu Ile His Tyr Tyr Lys Asp Leu Ser His Gly Met Glu Arg Ile
 245 250 255
 Glu Val Arg Ser Arg Ser Gly Ser Ala His Leu Gly His Val Phe Thr
 260 265 270
 Asp Gly Pro Arg Glu Leu Gly Gly Leu Arg Tyr Cys Ile Asn Ser Ala
 275 280 285
 Ser Leu Arg Phe Val Ala Lys Asp Glu Met Glu Lys Ala Gly Tyr Gly
 290 295 300
 Tyr Leu Leu Pro Tyr Leu Asn Lys
 305 310

<210> 155
 <211> 870
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 155
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 gaacaccaga ttggcaaattg gattccacat gacgagcgta atctcttgct caaaatcgct 180
 ttgcaaattg taccagactt gcaaccaaga cgcttgaaaa tgaccagtga tgtccctttg 240
 gcgcgcgggtt tgggttcttc cagctcgggtt atcggttgctg ggattgaact agccaaccaa 300
 ctgggtcaac tcaacttatc agaccatgaa aaattgcagt tagcgaccaa gattgaaggg 360
 catcctgaca atgtggctcc agccatttat ggtaatctcg ttattgcaag ttctgttgaa 420
 gggcaagtct ctgctatcgt agcagacttt ccagagtgtg attttctagc ttacattcca 480
 aactatgaat tacgtactcg cgacagccgt agtgtcttgc ctaaaaaatt gtcttataag 540
 gaagctggtt ctgcaagttc tatcgccaat gtagcgggtt ctgccttggt ggcaggagac 600
 atggtgaccg ctgggcaagc aatcgaggga gacctcttcc atgagcgcta tcgtcaggac 660
 ttggtaagag aatttgcgat gattaagcaa gtgaccaaag aaaatggggc ctatgcaacc 720
 tacctttctg gtgctgggccc gacagttatg gttctggctt ctcattgacaa gatgccaaca 780
 attaaggcag aattggaaaa gcaacctttc aaaggaaaac tgcattgactt gagagttgat 840
 acccaagggtg tccgtgtaga agcaaaataa 870

<210> 156
 <211> 289

<212> PRT

<213> Streptococcus pneumoniae

<400> 156

Met Lys Ile Ile Val Pro Ala Thr Ser Ala Asn Ile Gly Pro Gly Phe
1 5 10 15

Asp Ser Val Gly Val Ala Val Thr Lys Tyr Leu Gln Ile Glu Val Cys
20 25 30

Glu Glu Arg Asp Glu Trp Leu Ile Glu His Gln Ile Gly Lys Trp Ile
35 40 45

Pro His Asp Glu Arg Asn Leu Leu Leu Lys Ile Ala Leu Gln Ile Val
50 55 60

Pro Asp Leu Gln Pro Arg Arg Leu Lys Met Thr Ser Asp Val Pro Leu
65 70 75 80

Ala Arg Gly Leu Gly Ser Ser Ser Ser Val Ile Val Ala Gly Ile Glu
85 90 95

Leu Ala Asn Gln Leu Gly Gln Leu Asn Leu Ser Asp His Glu Lys Leu
100 105 110

Gln Leu Ala Thr Lys Ile Glu Gly His Pro Asp Asn Val Ala Pro Ala
115 120 125

Ile Tyr Gly Asn Leu Val Ile Ala Ser Ser Val Glu Gly Gln Val Ser
130 135 140

Ala Ile Val Ala Asp Phe Pro Glu Cys Asp Phe Leu Ala Tyr Ile Pro
145 150 155 160

Asn Tyr Glu Leu Arg Thr Arg Asp Ser Arg Ser Val Leu Pro Lys Lys
165 170 175

Leu Ser Tyr Lys Glu Ala Val Ala Ala Ser Ser Ile Ala Asn Val Ala
180 185 190

Val Ala Ala Leu Leu Ala Gly Asp Met Val Thr Ala Gly Gln Ala Ile
195 200 205

Glu Gly Asp Leu Phe His Glu Arg Tyr Arg Gln Asp Leu Val Arg Glu
210 215 220

Phe Ala Met Ile Lys Gln Val Thr Lys Glu Asn Gly Ala Tyr Ala Thr
225 230 235 240

Tyr Leu Ser Gly Ala Gly Pro Thr Val Met Val Leu Ala Ser His Asp
245 250 255

Lys Met Pro Thr Ile Lys Ala Glu Leu Glu Lys Gln Pro Phe Lys Gly
260 265 270

Lys Leu His Asp Leu Arg Val Asp Thr Gln Gly Val Arg Val Glu Ala
275 280 285

Lys

<210> 157
<211> 564
<212> DNA
<213> Streptococcus pneumoniae

<400> 157
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tcaacagctg catttggtga aacattggca ctgtatggta tcacacaaga ccatgacagt 120
gtctatcaag ctttaaaggt ttctactcct tttgcgattg agacattcgc tccaatttta 180
gagaattttt tagaaaagta caaggaaaat gaagccagag agcttgaaca cccgatttta 240
tttgaaggag tttctgacct attggaagac atttcaaatac aaggtggccg tcatttttttg 300
gtctctcatc gaaatgatca ggttttggaa attttagaaa aaacctctat agcagcttat 360
tttacagaag tggtgacttc tagctcaggc ttttaagagaa agccaaatcc cgaatccatg 420
ctttattttaa gagaaaagta tcagattagc tctggtcttg tcattggtga tcggccgatt 480
gatatcgaag caggtcaagc tgcaggactt gatacccact tgtttaccag tatcgtgaat 540
ttaagacaag tattagacat ataa 564

<210> 158
<211> 187
<212> PRT
<213> Streptococcus pneumoniae

<400> 158
Met Lys Tyr His Asp Tyr Ile Trp Asp Leu Gly Gly Thr Leu Leu Asp
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Asn Tyr Glu Thr Ser Thr Ala Ala Phe Val Glu Thr Leu Ala Leu Tyr
20 25 30
Gly Ile Thr Gln Asp His Asp Ser Val Tyr Gln Ala Leu Lys Val Ser
35 40 45
Thr Pro Phe Ala Ile Glu Thr Phe Ala Pro Asn Leu Glu Asn Phe Leu
50 55 60
Glu Lys Tyr Lys Glu Asn Glu Ala Arg Glu Leu Glu His Pro Ile Leu
65 70 75 80
Phe Glu Gly Val Ser Asp Leu Leu Glu Asp Ile Ser Asn Gln Gly Gly
85 90 95
Arg His Phe Leu Val Ser His Arg Asn Asp Gln Val Leu Glu Ile Leu
100 105 110
Glu Lys Thr Ser Ile Ala Ala Tyr Phe Thr Glu Val Val Thr Ser Ser
115 120 125
Ser Gly Phe Lys Arg Lys Pro Asn Pro Glu Ser Met Leu Tyr Leu Arg
130 135 140

Glu Lys Tyr Gln Ile Ser Ser Gly Leu Val Ile Gly Asp Arg Pro Ile
 145 150 155 160

Asp Ile Glu Ala Gly Gln Ala Ala Gly Leu Asp Thr His Leu Phe Thr
 165 170 175

Ser Ile Val Asn Leu Arg Gln Val Leu Asp Ile
 180 185

<210> 159
 <211> 1875
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 159
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 gaaggtcttc accatctagt ctgggaaatt gttgataact caattgacga ggccttggca 180
 ggatttgcca gccatattca agtttttatt gagccagatg attcgattac tgttgaggat 240
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 gtcttttacag tccttcacgc tggaggaaaag ttcggcgggtg gtggatacaa ggtttcaggt 360
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 gttcacaaaa atggtaagat tcattaccaa gaataccgtc gtggtcattgt tgtcgcagat 480
 cttgaaatag ttggagatac ggataaaaaca ggaacaactg ttcacttcac accggaccca 540
 aaaatcttca ctgaaacaac aatctttgat tttgataaat taaataaacg gattcaagag 600
 ttggcctttc taaatcgcg tcttcaaatt tcaattacag ataagcgcca aggtttggaa 660
 caaaccaagc attatcatta tgaagggtggg attgctagtt acgttgaata tatcaacgag 720
 aacaaggatg taatctttga tacaccaatc tatacagacg gtgagatgga tgatatcaca 780
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 ggggaagatg ttcgcggaagg cttaactgca gttatctcag ttaaaccacc aaatccacag 1020
 tttgaaggac aaaccaagac caaattggga aatagcgaag tgggtcaagat taccaatcgc 1080
 ctcttcagtg aagctttctc cgatttcctc atggaaaatc cacagattgc caaacgtatc 1140
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<210> 160
 <211> 624
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 160

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 20 25 30
 Met Tyr Ile Gly Ser Thr Ser Lys Glu Gly Leu His His Leu Val Trp
 35 40 45
 Glu Ile Val Asp Asn Ser Ile Asp Glu Ala Leu Ala Gly Phe Ala Ser
 50 55 60
 His Ile Gln Val Phe Ile Glu Pro Asp Asp Ser Ile Thr Val Val Asp
 65 70 75 80
 Asp Gly Arg Gly Ile Pro Val Asp Ile Gln Glu Lys Thr Gly Arg Pro
 85 90 95
 Ala Val Glu Thr Val Phe Thr Val Leu His Ala Gly Gly Lys Phe Gly
 100 105 110
 Gly Gly Gly Tyr Lys Val Ser Gly Gly Leu His Gly Val Gly Ser Ser
 115 120 125
 Val Val Asn Ala Leu Ser Thr Gln Leu Asp Val His Val His Lys Asn
 130 135 140
 Gly Lys Ile His Tyr Gln Glu Tyr Arg Arg Gly His Val Val Ala Asp
 145 150 155 160
 Leu Glu Ile Val Gly Asp Thr Asp Lys Thr Gly Thr Thr Val His Phe
 165 170 175
 Thr Pro Asp Pro Lys Ile Phe Thr Glu Thr Thr Ile Phe Asp Phe Asp
 180 185 190
 Lys Leu Asn Lys Arg Ile Gln Glu Leu Ala Phe Leu Asn Arg Gly Leu
 195 200 205
 Gln Ile Ser Ile Thr Asp Lys Arg Gln Gly Leu Glu Gln Thr Lys His
 210 215 220
 Tyr His Tyr Glu Gly Gly Ile Ala Ser Tyr Val Glu Tyr Ile Asn Glu
 225 230 235 240
 Asn Lys Asp Val Ile Phe Asp Thr Pro Ile Tyr Thr Asp Gly Glu Met
 245 250 255
 Asp Asp Ile Thr Val Glu Val Ala Met Gln Tyr Thr Thr Gly Tyr His
 260 265 270
 Glu Asn Val Met Ser Phe Ala Asn Asn Ile His Thr His Glu Gly Gly
 275 280 285
 Thr His Glu Gln Gly Phe Arg Thr Ala Leu Thr Arg Val Ile Asn Asp
 290 295 300

Tyr Ala Arg Lys Asn Lys Leu Leu Lys Asp Asn Glu Asp Asn Leu Thr
 305 310 315 320
 Gly Glu Asp Val Arg Glu Gly Leu Thr Ala Val Ile Ser Val Lys His
 325 330 335
 Pro Asn Pro Gln Phe Glu Gly Gln Thr Lys Thr Lys Leu Gly Asn Ser
 340 345 350
 Glu Val Val Lys Ile Thr Asn Arg Leu Phe Ser Glu Ala Phe Ser Asp
 355 360 365
 Phe Leu Met Glu Asn Pro Gln Ile Ala Lys Arg Ile Val Glu Lys Gly
 370 375 380
 Ile Leu Ala Ala Lys Ala Arg Val Ala Ala Lys Arg Ala Arg Glu Val
 385 390 395 400
 Thr Arg Lys Lys Ser Gly Leu Glu Ile Ser Asn Leu Pro Gly Lys Leu
 405 410 415
 Ala Asp Cys Ser Ser Asn Asn Pro Ala Glu Thr Glu Leu Phe Ile Val
 420 425 430
 Glu Gly Asp Ser Ala Gly Gly Ser Ala Lys Ser Gly Arg Asn Arg Glu
 435 440 445
 Phe Gln Ala Ile Leu Pro Ile Arg Gly Lys Ile Leu Asn Val Glu Lys
 450 455 460
 Ala Ser Met Asp Lys Ile Leu Ala Asn Glu Glu Ile Arg Ser Leu Phe
 465 470 475 480
 Thr Ala Met Gly Thr Gly Phe Gly Ala Glu Phe Asp Val Ser Lys Ala
 485 490 495
 Arg Tyr Gln Lys Leu Val Leu Met Thr Asp Ala Asp Val Asp Gly Ala
 500 505 510
 His Ile Arg Thr Leu Leu Leu Thr Leu Ile Tyr Arg Tyr Met Lys Pro
 515 520 525
 Ile Leu Glu Ala Gly Tyr Val Tyr Ile Ala Gln Pro Pro Ile Tyr Gly
 530 535 540
 Val Lys Val Gly Ser Glu Ile Lys Glu Tyr Ile Gln Pro Gly Ala Asp
 545 550 555 560
 Gln Glu Ile Lys Leu Gln Glu Ala Leu Ala Arg Tyr Ser Glu Gly Arg
 565 570 575
 Thr Lys Pro Thr Ile Gln Arg Tyr Lys Gly Leu Gly Glu Met Asp Asp
 580 585 590
 His Gln Leu Trp Glu Thr Thr Met Asp Pro Glu His Arg Leu Met Ala
 595 600 605

Arg Val Ser Val Asp Asp Val Gln Lys Gln Ile Lys Ser Leu Ile Cys
610 615 620

<210> 161
<211> 1446
<212> DNA
<213> Streptococcus pneumoniae

<400> 161
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gatagtgaga tcgaaaatgt tacgcaactg acgagtgtga cagcaccgac tgggactaat 420
aatgaaaata ttcagaaatt actagctgat atcaagtcaa gtcagaatac cgatttgacg 480
gtcaaccaga gttcgtctta cttggcagct tacaagagtt tgattgcagg ggagactaag 540
gccattgtcc taaatagtgt ctttgaaaac atcatcgagt cagagtatcc agactacgca 600
tcgaagataa aaaagattta tactaaggga ttcactaaaa aagtagaagc tcctaagacg 660
tctaagagtc agtctttcaa tatctatggt agtggaattg acacctatgg tcctattagt 720
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gttcgtgagc gctactccct agcagatggc gatcgtgacc gcgggcgcca tcaacaaaag 1140
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atcattaata gcttgcaaga ttctatccaa acaaatatgc cacttgagac catgataaat 1260
ttggtcaatg ctcagttaga aagtggaggg aattataaag taaattctca agatttaaaa 1320
gggacaggtc ggatggatct tccttcttat gcaatgccag acagtaacct ctatgtgatg 1380
gaaatagatg atagtagttt agctgtagtt aaagcagcta tacaggatgt gatggagggt 1440
agatga 1446

<210> 162
<211> 481
<212> PRT
<213> Streptococcus pneumoniae

<400> 162
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Val Asn Ile Val Leu Leu Thr Ile Tyr Leu Leu Leu Val Cys Phe Leu
20 25 30
Leu Phe Leu Ile Phe Lys Tyr Asn Ile Leu Ala Phe Arg Tyr Leu Asn
35 40 45
Leu Val Val Thr Ala Leu Val Leu Leu Val Ala Leu Val Gly Leu Leu

50 55 60
 Leu Ile Ile Tyr Lys Lys Ala Glu Lys Phe Thr Ile Phe Leu Leu Val
 65 70 75 80
 Phe Ser Ile Leu Val Ser Ser Val Ser Leu Phe Ala Val Gln Gln Phe
 85 90 95
 Val Gly Leu Thr Asn Arg Leu Asn Ala Thr Ser Asn Tyr Ser Glu Tyr
 100 105 110
 Ser Ile Ser Val Ala Val Leu Ala Asp Ser Glu Ile Glu Asn Val Thr
 115 120 125
 Gln Leu Thr Ser Val Thr Ala Pro Thr Gly Thr Asn Asn Glu Asn Ile
 130 135 140
 Gln Lys Leu Leu Ala Asp Ile Lys Ser Ser Gln Asn Thr Asp Leu Thr
 145 150 155 160
 Val Asn Gln Ser Ser Ser Tyr Leu Ala Ala Tyr Lys Ser Leu Ile Ala
 165 170 175
 Gly Glu Thr Lys Ala Ile Val Leu Asn Ser Val Phe Glu Asn Ile Ile
 180 185 190
 Glu Ser Glu Tyr Pro Asp Tyr Ala Ser Lys Ile Lys Lys Ile Tyr Thr
 195 200 205
 Lys Gly Phe Thr Lys Lys Val Glu Ala Pro Lys Thr Ser Lys Ser Gln
 210 215 220
 Ser Phe Asn Ile Tyr Val Ser Gly Ile Asp Thr Tyr Gly Pro Ile Ser
 225 230 235 240
 Ser Val Ser Arg Ser Asp Val Asn Ile Leu Met Thr Val Asn Arg Asp
 245 250 255
 Thr Lys Lys Ile Leu Leu Thr Thr Thr Pro Arg Asp Ala Tyr Val Pro
 260 265 270
 Ile Ala Asp Gly Gly Asn Asn Gln Lys Asp Lys Leu Thr His Ala Gly
 275 280 285
 Ile Tyr Gly Val Asp Ser Ser Ile His Thr Leu Glu Asn Leu Tyr Gly
 290 295 300
 Val Asp Ile Asn Tyr Tyr Val Arg Leu Asn Phe Thr Ser Phe Leu Lys
 305 310 315 320
 Leu Ile Asp Leu Leu Gly Gly Ile Asp Val Tyr Asn Asp Gln Glu Phe
 325 330 335
 Thr Ala His Thr Asn Gly Lys Tyr Tyr Pro Ala Gly Asn Val His Leu
 340 345 350
 Asp Ser Glu Gln Ala Leu Gly Phe Val Arg Glu Arg Tyr Ser Leu Ala

355 360 365
 Asp Gly Asp Arg Asp Arg Gly Arg His Gln Gln Lys Val Ile Val Ala
 370 375 380
 Ile Leu Gln Lys Leu Thr Ser Thr Glu Val Leu Lys Asn Tyr Ser Thr
 385 390 395 400
 Ile Ile Asn Ser Leu Gln Asp Ser Ile Gln Thr Asn Met Pro Leu Glu
 405 410 415
 Thr Met Ile Asn Leu Val Asn Ala Gln Leu Glu Ser Gly Gly Asn Tyr
 420 425 430
 Lys Val Asn Ser Gln Asp Leu Lys Gly Thr Gly Arg Met Asp Leu Pro
 435 440 445
 Ser Tyr Ala Met Pro Asp Ser Asn Leu Tyr Val Met Glu Ile Asp Asp
 450 455 460
 Ser Ser Leu Ala Val Val Lys Ala Ala Ile Gln Asp Val Met Glu Gly
 465 470 475 480
 Arg

<210> 163
 <211> 732
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 163
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 gaaagcaagg ctctcttgge agaatacctac agacaggggg tgcaaacat tgtttctacc 120
 tctcaccgtc gcaagggcat gtttgaaact ccggaagaga agatagcaga aaactttctt 180
 cagggttcggg aaatagctaa ggaagtggcg agtgacttgg tcattgctta cggggctgaa 240
 atttattaca caccagatgt tctggataag ctggaaaaaa agcggattcc gacctcaat 300
 gatagtcggt atgccttgat agagtttagt atgaacactc cttatcgca tattcatagc 360
 gccttgagca agatcttgat gttgggaatt actccagtca ttgccacat tgagcgctat 420
 gatgctcttg aaaataatga aaaacgcgtt cgagaactga tcgatatggg ctgttacacg 480
 caagtaaata gttcacatgt cctcaaacc aaacttttg gcgaacgta taaattcatg 540
 aaaaaagag ctcagtattt tttagagcag gatttggttc atgtcattgc aagtgatatg 600
 cacaatctag acggtagacc tcctcatatg gcagaagcat atgaccttgt taccacaaaa 660
 tacggagaag cgaaggctca ggaacttttt atagacaatc ctcgaaaaat tgtaatggat 720
 caactaattt ag 732

<210> 164
 <211> 243
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 164
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Lys Ser Arg Glu Glu Ser Lys Ala Leu Leu Ala Glu Ser Tyr Arg Gln
 20 25 30
 Gly Val Arg Thr Ile Val Ser Thr Ser His Arg Arg Lys Gly Met Phe
 35 40 45
 Glu Thr Pro Glu Glu Lys Ile Ala Glu Asn Phe Leu Gln Val Arg Glu
 50 55 60
 Ile Ala Lys Glu Val Ala Ser Asp Leu Val Ile Ala Tyr Gly Ala Glu
 65 70 75 80
 Ile Tyr Tyr Thr Pro Asp Val Leu Asp Lys Leu Glu Lys Lys Arg Ile
 85 90 95
 Pro Thr Leu Asn Asp Ser Arg Tyr Ala Leu Ile Glu Phe Ser Met Asn
 100 105 110
 Thr Pro Tyr Arg Asp Ile His Ser Ala Leu Ser Lys Ile Leu Met Leu
 115 120 125
 Gly Ile Thr Pro Val Ile Ala His Ile Glu Arg Tyr Asp Ala Leu Glu
 130 135 140
 Asn Asn Glu Lys Arg Val Arg Glu Leu Ile Asp Met Gly Cys Tyr Thr
 145 150 155 160
 Gln Val Asn Ser Ser His Val Leu Lys Pro Lys Leu Phe Gly Glu Arg
 165 170 175
 Tyr Lys Phe Met Lys Lys Arg Ala Gln Tyr Phe Leu Glu Gln Asp Leu
 180 185 190
 Val His Val Ile Ala Ser Asp Met His Asn Leu Asp Gly Arg Pro Pro
 195 200 205
 His Met Ala Glu Ala Tyr Asp Leu Val Thr Gln Lys Tyr Gly Glu Ala
 210 215 220
 Lys Ala Gln Glu Leu Phe Ile Asp Asn Pro Arg Lys Ile Val Met Asp
 225 230 235 240
 Gln Leu Ile

<210> 165
 <211> 3990
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 165
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 ggatttgcct tccaagcaca gactgttgca gccgatggag ttactcctac tactacagaa 180

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aaccaaccga ccatccatac ggttttctgat tccccctcaat catccgaaaa tcggactgag 240
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attccattta ccacagtgc ttgtgaaaat ccactcttac tcaaaggaaa aacacaagtc 3600

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<210> 166

<211> 1329

<212> PRT

<213> Streptococcus pneumoniae

<400> 166

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      20             25             30

Val Gly Ala Ala Ser Val Leu Ile Gly Phe Ala Phe Gln Ala Gln Thr
      35             40             45

Val Ala Ala Asp Gly Val Thr Pro Thr Thr Thr Glu Asn Gln Pro Thr
      50             55             60

Ile His Thr Val Ser Asp Ser Pro Gln Ser Ser Glu Asn Arg Thr Glu
      65             70             75             80

Glu Thr Pro Lys Ala Val Leu Gln Pro Glu Ala Pro Lys Thr Val Glu
      85             90             95

Thr Glu Thr Pro Ala Thr Asp Lys Val Ala Ser Leu Pro Lys Thr Glu
     100             105             110

Glu Lys Pro Gln Glu Glu Val Ser Ser Thr Pro Ser Asp Lys Ala Glu
     115             120             125

Val Val Thr Pro Thr Ser Ala Glu Lys Glu Thr Ala Asn Lys Lys Ala
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Glu Glu Ala Ser Pro Lys Lys Glu Glu Ala Lys Glu Val Asp Ser Lys
     145             150             155             160

Glu Ser Asn Thr Asp Lys Thr Asp Lys Asp Lys Pro Ala Lys Lys Asp
     165             170             175

Glu Ala Lys Ala Glu Ala Asp Lys Pro Ala Thr Glu Ala Gly Lys Glu
     180             185             190

Arg Ala Ala Thr Val Asn Glu Lys Leu Ala Lys Lys Lys Ile Val Ser
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Ile Asp Ala Gly Arg Lys Tyr Phe Ser Pro Glu Gln Leu Lys Glu Ile
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 260 265 270
 Gly Thr Asn Asp Tyr Tyr Asn Asp Pro Asn Gly Asn His Leu Thr Glu
 275 280 285
 Ser Gln Met Thr Asp Leu Ile Asn Tyr Ala Lys Asp Lys Gly Ile Gly
 290 295 300
 Leu Ile Pro Thr Val Asn Ser Pro Gly His Met Asp Ala Ile Leu Asn
 305 310 315 320
 Ala Met Lys Glu Leu Gly Ile Gln Asn Pro Asn Phe Ser Tyr Phe Gly
 325 330 335
 Lys Lys Ser Ala Arg Thr Val Asp Leu Asp Asn Glu Gln Ala Val Ala
 340 345 350
 Phe Thr Lys Ala Leu Ile Asp Lys Tyr Ala Ala Tyr Phe Ala Lys Lys
 355 360 365
 Thr Glu Ile Phe Asn Ile Gly Leu Asp Glu Tyr Ala Asn Asp Ala Thr
 370 375 380
 Asp Ala Lys Gly Trp Ser Val Leu Gln Ala Asp Lys Tyr Tyr Pro Asn
 385 390 395 400
 Glu Gly Tyr Pro Val Lys Gly Tyr Glu Lys Phe Ile Ala Tyr Ala Asn
 405 410 415
 Asp Leu Ala Arg Ile Val Lys Ser His Gly Leu Lys Pro Met Ala Phe
 420 425 430
 Asn Asp Gly Ile Tyr Tyr Asn Ser Asp Thr Ser Phe Gly Ser Phe Asp
 435 440 445
 Lys Asp Ile Ile Val Ser Met Trp Thr Gly Gly Trp Gly Gly Tyr Asp
 450 455 460
 Val Ala Ser Ser Lys Leu Leu Ala Glu Lys Gly His Gln Ile Leu Asn
 465 470 475 480
 Thr Asn Asp Ala Trp Tyr Tyr Val Leu Gly Arg Asn Ala Asp Gly Gln
 485 490 495
 Gly Trp Tyr Asn Leu Asp Gln Gly Leu Asn Gly Ile Lys Asn Thr Pro
 500 505 510
 Ile Thr Ser Val Pro Lys Thr Glu Gly Ala Asp Ile Pro Ile Ile Gly
 515 520 525

Gly Met Val Ala Ala Trp Ala Asp Thr Pro Ser Ala Arg Tyr Ser Pro
 530 535 540
 Ser Arg Leu Phe Lys Leu Met Arg His Phe Ala Asn Ala Asn Ala Glu
 545 550 555 560
 Tyr Phe Ala Ala Asp Tyr Glu Ser Ala Glu Gln Ala Leu Asn Glu Val
 565 570 575
 Pro Lys Asp Leu Asn Arg Tyr Thr Ala Glu Ser Val Thr Ala Val Lys
 580 585 590
 Glu Ala Glu Lys Ala Ile Arg Ser Leu Asp Ser Asn Leu Ser Arg Ala
 595 600 605
 Gln Gln Asp Thr Ile Asp Gln Ala Ile Ala Lys Leu Gln Glu Thr Val
 610 615 620
 Asn Asn Leu Thr Leu Thr Pro Glu Ala Gln Lys Glu Glu Glu Ala Lys
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 Arg Glu Val Glu Lys Leu Ala Lys Asn Lys Val Ile Ser Ile Asp Ala
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 Gly Arg Lys Tyr Phe Thr Leu Asn Gln Leu Lys Arg Ile Val Asp Lys
 660 665 670
 Ala Ser Glu Leu Gly Tyr Ser Asp Val His Leu Leu Leu Gly Asn Asp
 675 680 685
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 690 695 700
 Thr Tyr Ala Ser Asp Asp Val Lys Lys Ala Ile Ile Glu Gly Thr Lys
 705 710 715 720
 Ala Tyr Tyr Asp Asp Pro Asn Gly Thr Ala Leu Thr Gln Ala Glu Val
 725 730 735
 Thr Glu Leu Ile Glu Tyr Ala Lys Ser Lys Asp Ile Gly Leu Ile Pro
 740 745 750
 Ala Ile Asn Ser Pro Gly His Met Asp Ala Met Leu Val Ala Met Glu
 755 760 765
 Lys Leu Gly Ile Lys Asn Pro Gln Ala His Phe Asp Lys Val Ser Lys
 770 775 780
 Thr Thr Met Asp Leu Lys Asn Glu Glu Ala Met Asn Phe Val Lys Ala
 785 790 795 800
 Leu Ile Gly Lys Tyr Met Asp Phe Phe Ala Gly Lys Thr Lys Ile Phe
 805 810 815
 Asn Phe Gly Thr Asp Glu Tyr Ala Asn Asp Ala Thr Ser Ala Gln Gly
 820 825 830

Trp Tyr Tyr Leu Lys Trp Tyr Gln Leu Tyr Gly Lys Phe Ala Glu Tyr
 835 840 845
 Ala Asn Thr Leu Ala Ala Met Ala Lys Glu Arg Gly Leu Gln Pro Met
 850 855 860
 Ala Phe Asn Asp Gly Phe Tyr Tyr Glu Asp Lys Asp Asp Val Gln Phe
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 Asp Lys Asp Val Leu Ile Ser Tyr Trp Ser Lys Gly Trp Trp Gly Tyr
 885 890 895
 Asn Leu Ala Ser Pro Gln Tyr Leu Ala Ser Lys Gly Tyr Lys Phe Leu
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 Phe Asn Gln Leu Ala Ser Thr Lys Tyr Pro Glu Val Asp Leu Pro Thr
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 Val Gly Ser Met Leu Ser Ile Trp Ala Asp Arg Pro Ser Ala Glu Tyr
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 980 985 990
 Lys Asp Tyr Phe Arg Ala Asn Tyr Asn Ala Leu Arg Glu Glu Leu Ala
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 1045 1050 1055
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 1060 1065 1070
 Val Ala Ala Asn Val Glu Thr Arg Pro Glu Leu Ile Thr Arg Thr Glu
 1075 1080 1085
 Glu Ile Pro Phe Glu Val Ile Lys Lys Glu Asn Pro Asn Leu Pro Ala
 1090 1095 1100
 Gly Gln Glu Asn Ile Ile Thr Ala Gly Val Lys Gly Glu Arg Thr His
 1105 1110 1115 1120
 Tyr Ile Ser Val Leu Thr Glu Asn Gly Lys Thr Thr Glu Thr Val Leu
 1125 1130 1135

Asp Ser Gln Val Thr Lys Glu Val Ile Asn Gln Val Val Glu Val Gly
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 Ala Pro Val Thr His Lys Gly Asp Glu Ser Gly Leu Ala Pro Thr Thr
 1155 1160 1165
 Glu Val Lys Pro Arg Leu Asp Ile Gln Glu Glu Glu Ile Pro Phe Thr
 1170 1175 1180
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 Thr Ser Ala Asp Gly Lys Glu Val Lys Thr Leu Val Asn Ser Val Val
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 Ala Gln Glu Ala Val Thr Gln Ile Val Glu Val Gly Thr Met Val Thr
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 His Val Gly Asp Glu Asn Gly Gln Ala Ala Ile Ala Glu Glu Lys Pro
 1250 1255 1260
 Lys Leu Glu Ile Pro Ser Gln Pro Ala Pro Ser Thr Ala Pro Ala Glu
 1265 1270 1275 1280
 Glu Ser Lys Val Leu Pro Gln Asp Pro Ala Pro Val Val Thr Glu Lys
 1285 1290 1295
 Lys Leu Pro Glu Thr Gly Thr His Asp Ser Ala Gly Leu Val Val Ala
 1300 1305 1310
 Gly Leu Met Ser Thr Leu Ala Ala Tyr Gly Leu Thr Lys Arg Lys Glu
 1315 1320 1325

Asp

<210> 167
 <211> 825
 <212> DNA
 <213> Streptococcus pneumoniae

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 gggagctatt atatcaagca gatgccgtcg gcacctataa gtcccaaac caatcttagt 120
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 gggtggcatc aggtcaagaa tctaaagggc tcttataccc atgcagtcga tagaggatcat 480
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 aaaaacattg ctgttcagac agcctgggca aatcaggcac aagccgagta ttcgactggt 600

caaaactact atgaaagcaa ggtgcgtaaa gccttggacc aaaacaagcg tgtccgttac 660
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 gccaaagtctt cggatggaga attggaattc aatgttctag ttcccaatgt tcaaaaggga 780
 cttcaactgg attaccgaac tggagaagta actgtaactc agtaa 825

<210> 168

<211> 274

<212> PRT

<213> Streptococcus pneumoniae

<400> 168

| | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Asn | Lys | Lys | Thr | Arg | Gln | Thr | Leu | Ile | Gly | Leu | Leu | Val | Leu | Leu | 1 | 5 | 10 | 15 |
| Leu | Leu | Ser | Thr | Gly | Ser | Tyr | Tyr | Ile | Lys | Gln | Met | Pro | Ser | Ala | Pro | 20 | 25 | 30 | |
| Asn | Ser | Pro | Lys | Thr | Asn | Leu | Ser | Gln | Lys | Lys | Gln | Ala | Ser | Glu | Ala | 35 | 40 | 45 | |
| Pro | Ser | Gln | Ala | Leu | Ala | Glu | Ser | Val | Leu | Thr | Asp | Ala | Val | Lys | Ser | 50 | 55 | 60 | |
| Gln | Ile | Lys | Gly | Ser | Leu | Glu | Trp | Asn | Gly | Ser | Gly | Ala | Phe | Ile | Val | 65 | 70 | 75 | 80 |
| Asn | Gly | Asn | Lys | Thr | Asn | Leu | Asp | Ala | Lys | Val | Ser | Ser | Lys | Pro | Tyr | 85 | 90 | 95 | |
| Ala | Asp | Asn | Lys | Thr | Lys | Thr | Val | Gly | Lys | Glu | Thr | Val | Pro | Thr | Val | 100 | 105 | 110 | |
| Ala | Asn | Ala | Leu | Leu | Ser | Lys | Ala | Thr | Arg | Gln | Tyr | Lys | Asn | Arg | Lys | 115 | 120 | 125 | |
| Glu | Thr | Gly | Asn | Gly | Ser | Thr | Ser | Trp | Thr | Pro | Pro | Gly | Trp | His | Gln | 130 | 135 | 140 | |
| Val | Lys | Asn | Leu | Lys | Gly | Ser | Tyr | Thr | His | Ala | Val | Asp | Arg | Gly | His | 145 | 150 | 155 | 160 |
| Leu | Leu | Gly | Tyr | Ala | Leu | Ile | Gly | Gly | Leu | Asp | Gly | Phe | Asp | Ala | Ser | 165 | 170 | 175 | |
| Thr | Ser | Asn | Pro | Lys | Asn | Ile | Ala | Val | Gln | Thr | Ala | Trp | Ala | Asn | Gln | 180 | 185 | 190 | |
| Ala | Gln | Ala | Glu | Tyr | Ser | Thr | Gly | Gln | Asn | Tyr | Tyr | Glu | Ser | Lys | Val | 195 | 200 | 205 | |
| Arg | Lys | Ala | Leu | Asp | Gln | Asn | Lys | Arg | Val | Arg | Tyr | Arg | Val | Thr | Leu | 210 | 215 | 220 | |
| Tyr | Tyr | Ala | Ser | Asn | Glu | Asp | Leu | Val | Pro | Ser | Ala | Ser | Gln | Ile | Glu | 225 | 230 | 235 | 240 |

Ala Lys Ser Ser Asp Gly Glu Leu Glu Phe Asn Val Leu Val Pro Asn
245 250 255

Val Gln Lys Gly Leu Gln Leu Asp Tyr Arg Thr Gly Glu Val Thr Val
260 265 270

Thr Gln

<210> 169

<211> 225

<212> DNA

<213> Streptococcus pneumoniae

<400> 169

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ggtttaaatg taggttatgg aatcttgggc aagggtcaag atccatgggc tatcctgtct 180
ccagcaaaat ggcaggaatt gattcataaa ttacaggaa attag 225

<210> 170

<211> 74

<212> PRT

<213> Streptococcus pneumoniae

<400> 170

Val Leu Arg Phe Ser Gly Leu Arg Gln Val Met Lys Met Asn Lys Lys
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Ser Ser Tyr Val Val Lys Arg Leu Leu Leu Val Ile Ile Val Leu Ile
20 25 30

Leu Gly Thr Leu Ala Leu Gly Ile Gly Leu Met Val Gly Tyr Gly Ile
35 40 45

Leu Gly Lys Gly Gln Asp Pro Trp Ala Ile Leu Ser Pro Ala Lys Trp
50 55 60

Gln Glu Leu Ile His Lys Phe Thr Gly Asn
65 70

<210> 171

<211> 40

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 171

cgagatctga tatctcacia acagataacg gcgtaaataag

40

<210> 172
 <211> 43
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: Primer

 <400> 172
 gaagatcttc cccgggatca caaacagata acggcgtaaa tag 43

 <210> 173
 <211> 42
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: Primer

 <400> 173
 cgagatctga tatccatcac aaacagataa cggcgtaaag ag 42

 <210> 174
 <211> 32
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: Primer

 <400> 174
 cgggacctt atggacctga atcagcggtg tc 32

 <210> 175
 <211> 23
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: Primer

 <400> 175
 ggatgctttg tttcaggtgt atc 23

 <210> 176
 <211> 82
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: Primer

<400> 176
catgatatcg gtacctcaag ctcatatcat tgtccggcaa tgggtgtgggc tttttttggt 60
ttagcggata acaatttcac ac 82

<210> 177
<211> 81
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Primer

<400> 177
gcggtatcccc cgggcttaat taatgtttta acactagtcg aagatctcgc gaattctcct 60
gtgtgaaatt gttatccgct a 81

<210> 178
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Primer

<400> 178
cgccagggtt ttcccagtcg cgac 24

<210> 179
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Primer

<400> 179
tcaggggggc ggagcctatg 20

<210> 180
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Primer

<400> 180
tcgtatgttg tgtggaattg tg 22

<210> 181
<211> 26
<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 181

tccggctcgt atgttggtg gaattg

26

<210> 182

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<221> SITE

<222> (3)

<223> Xaa=Any amino acid

<220>

<223> Description of Artificial Sequence: Cell wall
anchoring motif

<400> 182

Leu Pro Xaa Thr Gly

1

5

<210> 183

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 183

gcgggatccg ccaccatg

18

<210> 184

<211> 10

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 184

ttgcggccgc

10

<210> 185

<211> 43

<212> DNA

<213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Primer

<400> 185
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<210> 186
 <211> 36
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Primer

<400> 186
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<210> 187
 <211> 36
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Primer

<400> 187
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<210> 188
 <211> 38
 <212> DNA
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<220>
 <223> Description of Artificial Sequence: Primer

<400> 188
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<210> 189
 <211> 35
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Primer

<400> 189
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<210> 190

<211> 32
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: Primer

 <400> 190
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 <210> 191
 <211> 38
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: Primer

 <400> 191
 cggatccgcc accatgcaaa aagagcggta tggttatg 38

 <210> 192
 <211> 30
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: Primer

 <400> 192
 ttgcggccgc acccccattc ttaatccctt 30

 <210> 193
 <211> 40
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: Primer

 <400> 193
 cggatccgcc accatggagg tatgtgaaat gtcacgtaaa 40

 <210> 194
 <211> 32
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: Primer

 <400> 194
 ttgcggccgc ttttaciaaag tcaagcaaag cc 32

<210> 195
 <211> 48
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 195
 Gly Ile Arg Leu Arg Asn Met Leu Phe Lys Ile Trp Pro Ala Val Ala
 1 5 10 15
 Leu Val Thr Ser Ser Gly Asn Asn Val Ser Met Leu His Ser Ile Ala
 20 25 30
 Asn Met Gly Gln Leu Thr Leu Gly Thr Gln Cys Gln Thr Val Val Val
 35 40 45

<210> 196
 <211> 11
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 196
 Gln Lys Ile Thr Met Ile Thr Phe Thr Phe Gln
 1 5 10